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PERFORMANCE CHARACTERISTICS
OF 1977 FORD 300 CID ENGINE

DEPARTMENT OF TRANSPORTATION

MAR 31 1980

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Joseph Boziuk

U.S. DEPARTMENT OF TRANSPORTATION RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

Transportation Systems Center Cambridge MA 02142



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PREFACE

This report was prepared under PPA HS027, Research and Analysis in Automotive Fuel Economy and Related Areas, sponsored by the Technology Assessment Division of the National Highway Traffic Safety Administration. It presents the results of laboratory testing of the 1977 Ford 300 CID engine to determine fuel economy and emissions over a sufficient speed-load range to effectively map the engine.

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1. INTRODUCTION

The purpose of the study was to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. This work supports the data base of the VEHSIM (Vehicle Simulator) Computer program at the Transportation Systems Center (TSC).

The data presented in this report are for a 6-cylinder spark ignition 1977 Ford 300 CID engine with a catalytic converter, EGR, manifold preheated air inlet system, alternator (driven only, no output) and fan. The engine as equipped is intended for use in a forty-nine state (Federal) vehicle with automatic transmission. The test results present steady-state data sufficient to map the engine for fuel economy and emissions (carbon monoxide, hydrocarbons, and oxides of nitrogen) over the entire operating range of the engine.

2. ENGINE TEST REPORT

The engine test set-up included a complete mean tolerance engine (SAE definition) coupled to Schenck eddy-current dynamometer capable of absorbing 180 horsepower and 250 lb-ft of torque. The alternator was included but not wired into the engine's electrical system. The engine was also equipped with a catalytic converter, EGR, fan, and preheated air inlet system.

The manufacturer's specifications for the engine are given in Table 1.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Year	1977
Manufacturer	Ford Motor Company
Displacement	300 CID
No. Cylinders	6
Maximum Horsepower	119 BHP @ 3000 RPM
Maximum Torque	223 lb - ft @ 1600 RPM
Carburetor	1 V
Bore and Stroke	4.00 in. x 3.98 in.
Compression Ratio	7.9

Emissions instrumentation consisted of the following Beckman Instruments Corp. instruments.

CO	Model	864	Infrared Analyzer (NDIR)
CO2	Model	864	Infrared Analyzer (NDIR)
NO/NO _x	Model	951	Chemiluminescent Detector
02	Mode1	F3	Paramagnetic Analyzer
HC	Model	402	Flame Ionization Detector

Prior to testing, the engine break-in consisted of following the schedule shown in Table 2. A single batch of unleaded gasoline was used for break-in and engine testing. The gasoline specifications are shown in Table 3.

TABLE 2. ENGINE BREAK-IN SCHEDULE

PROGRAM 1:	<u>MPH</u>	RPM	DURATION (MINUTES)
	20	935	4
	40	1290	4
	60	1935	4
	50	1615	4
	30	970	4

(37 Cycles for an Accumulated 500 Miles)

PROGRAM 2:	MPH	RPM	DURATION (MINUTES)
	40	1290	4
	60	1935	4
	70	2260	4
	60	1935	4
	70	2260	4
	65	2100	4
	55	1775	4

(36 Cycles for an Accumulated 1500 Miles)

TABLE 3. FUEL SPECIFICATIONS

TYPE		AMCO INDOLENE
Specific gravity Percent Carbon Percent Hydrogen	@ 60°F	0.7416 85.34 14.32

During the steady-state test, the engine was operated at the following speed-load modes:

SPEED-RPM			LOADS	-TORC	UE				
735 1000 1200 1600 2000 2500 3000	0%, 10%,	20%, 30%,	40%,	0 55%,	70%,	85%,	100%	WOT	Torque

Each test point was duplicated and the following data were recorded for each:

Ambient Pressure, mm Hg

Ambient Temperature, °F

Ambient Relative Humidity, %

Engine Speed, RPM

Torque, 1b-ft.

Accumulated Fuel, cc (Fluidyne model 1250)

Ignition Timing, °BTDC

Manifold Vacuum, inches Hg

Throttle Angle, degrees

Oil Pump Exit Pressure, psi

Oil Temperature, °F

Coolant Exit Temperature, °F

Exhaust Temperature Before Catalyst, °F

Exhaust Pressure Before Catalyst, inches H₂O

Emissions Concentrations After Catalyst, dry basis:

CO,

CO₂, %

HC, ppm

 NO_x , ppm

Exhaust Temperature After Catalyst, °F.

The following equations were used in calculating corrected torque, corrected horsepower, mass fuel flow rate, corrected brake specific fuel consumption, air-to-fuel ratio based on emissions, mass emission rates of CO, HC, NO_{χ} , and ambient absolute humidity.

CORRECTED TORQUE, Tc (1b-ft) (1) From SAE J245, Spark Ignition Engine Rating Code, adjusted to standard SAE ambient conditions:

$$T_{c} = \frac{B_{d}^{\star}}{B_{dt}} \left(\frac{t_{t} + A}{t^{\star} + A} \right)^{1/2} T_{t}$$

where

 B_d^* = Standard Dry Barometric Pressure (29.00 in Hg, 97.9 kPa)

B_{dt} = Dry Barometric Pressure at Test Conditions

 t_t = Ambient Air Temperature at Test Conditions

t* = Standard Ambient Temperature (85°F, 29.4°C)

A = Absolute Temperature Constant (460°R, 273°K)

T₊ = Measured Torque at Test Conditions.

CORRECTED HORSEPOWER, hpc (1) From SAE J245, Spark Ignition Engine Rating Code, adjusted to standard SAE ambient conditions:

$$hp_C = \frac{T_C N}{G}$$

where

T_C = Corrected Torque (See Above)

N = Engine Speed (RPM)

G = Power Constant (5252 English, 955 SI).

⁽¹⁾ Engines with manifold preheated air inlet systems are designed to control carburetor air inlet temperature to a specific temperature. Excursions in ambient temperature below this value do not appreciably affect the controlled temperature. The engine performance correction factor as described in SAE J245 Engine Rating Code for Spark Ignition Engines has therefore been updated as follows: If ambient temperature is less than or equal to the manufacturer's stated controlled temperatures, no correction component involving carburetor inlet temperature is made. If ambient temperature exceeds the targeted controlled temperature, the normal J245 correction factor is applied with the targeted controlled temperature used in place of the standard ambient temperature.

MASS FUEL FLOW RATE (1b/hr) From volumetric measurement (corrected to 60°F per ASTM petroleum tables) and fuel specific gravity:

$$\dot{m}_{f} = \frac{(SpG)_{f} \left(\frac{1b}{vol} + \frac{H_{2}0}{vol}\right) (vol)_{f}}{\Delta t_{T}}$$

where

m_f = Fuel Flow Rate 1b/hr

(SpG)_f = Specific Gravity of Fuel

 $(1b H_2 O/vol) = Pounds of Water per Unit Volume$

(vol_f) = Volume of Fuel Measured, corrected to 60°F per ASTM petroleum tables

 Δt_T = Time Interval of Volume Measurement (hrs).

CORRECTED BRAKE SPECIFIC FUEL CONSUMPTION (BSFC) (1b/HP-Hr)

 $BSFC_{c} = \frac{m_{f}}{HP_{c}}$

where

BSFC = Corrected Brake Specific Fuel Consumption

HP_c = Corrected Horsepower

mf - Mass Fuel Flow Rate (1b/hr).

AIR/FUEL RATIO (A/F) Based on emissions measurements from SPINDT, SAE #650507:

A/F = F_b
$$\left[11.492 \text{ F}_{c} \left(\frac{1+R/2+Q}{1+R} \right) + \left(\frac{120(1-FC)}{3.5+R} \right) \right]$$

where

$$R = \frac{\% CO}{\% CO_2} = \frac{Percent CO}{Percent CO_2} \frac{Concentration}{Concentration}$$

 F_c = Mass Fraction of Carbon in Fuel

$$F_{b} = \frac{\% \ CO + \% \ CO_{2}}{\% \ CO + \% \ CO_{2} + \% \ CH}$$

$$Q = \frac{\% O_2}{\% CO_2} = \frac{\text{Percent } O_2 \text{ Concentration}}{\text{Percent } CO_2 \text{ Concentration}}$$

CARBON MONOXIDE (CO) MASS EMISSION RATE (Grams/Hr)

MASS CO = (4.383)
$$(\mathring{m}_f)(A/F+1)(\%CO)$$

$$\frac{1}{1 + 0.03148 (\% CO_2) \frac{\%CO+\%CO_2}{\%CO+3\%CO_2}}$$

where

m_f = Mass Fuel Flow Rate

A/F = Air to Fuel Ratio

% CO = Percent CO Concentration

% CO₂ = Percent CO₂ Concentration .

HYDROCARBON (HC) MASS EMISSION RATE (Grams/Hr)

Mass HC = (0.0002207) (\dot{m}_f) (A/F+1) (ppm HC)

where

m_f = Mass Fuel Flow Rate

A/F = Air to Fuel Ratio

ppm HC = Parts per Million of HC Concentration.

OXIDES OF NITROGEN (NO) MASS EMISSIONS RATE (Gram/Hr)

Mass NO_x = 0.007201 (\dot{m}_f) (A/F+1) (ppm NO_x) $\frac{1}{1 + .03148 \text{ (% CO}_2) \left(\frac{\%\text{CO} + \%\text{CO}_2}{\%\text{CO} + 3\%\text{CO}_2}\right)}$

where

m_f = Mass Fuel Flow Rate

A/F = Air to Fuel Ration

 $ppm NO_{\chi} = Parts per Million NO_{\chi} Concentration$

% CO = Percent CO Concentration

% CO₂ = Percent CO₂ Concentration

K_u = Humidity Correction Factor

HUMIDITY CORRECTION FACTOR

 $K_{H} = \frac{1}{1 - .0047 \text{ (Absolute Humidity -75)}}$

where absolute humidity is in grams/pound of dry air.

ABSOLUTE HUMIDITY (AH) (Grains/Lb Dry Air):

$$AH = \frac{(RH) P_{SU}}{1.608 (P_{AMB} - RH \cdot P_{SU})}$$

where

RH = Measured Relative Humidity

PSU = Saturated Vapor Pressure (from Keenan and Keyes

Steam Tables)

P_{AMB} = Ambient Barometric Pressure.

3. DISCUSSION OF TEST RESULTS

Appendixes A and B summarize engine map data in tabular and graphical form, respectivley. Each test point is repeated once. Fuel consumption, hydrocarbon mass rates, and oxides of nitrogen mass rates demonstrated excellent repeatability. Air-to-fuel rates, however, were not very repeatable below 1600 RPM.

APPENDIX A TABULAR SUMMARY OF ENGINE MAP DATA

Mind in the second seco	FORE 300 CID	0.				
1	6/20/77	124 7719/77		6/20/77	6/20/77	5/02/9
	759.0	765.0	759.0	1 0°85L	758.4	
	1 52. 1	91.	53.	48.	200	
Ambient temperature, F	1.92		17.	1	77.	
	·	661	10001	1000	10001	00
		0	0.1	6	42.1	, m
Power, bhp.	0.0	0.0	0.0	3.7	8.0	12.2
•			4.7	5.3	5.9	
de			23.0	23.0	30.0	
-	2	2.	-23.9	2.	-19.4	9
•		0	1.5	3.5	2.0	œ
S	********	C	********	1.419	0.738	5
Oil temperature, F	189.	9	197.	95	200.	0
Oil pressure, psi	1 43. 1	2	52.	52. 1	52.	
Coolant temperatue, F	195.		200.	199.	192.1	
					_	
ture, F.	1 434.	431.	206.	617.	700.	
9	1.3	1.3	0.5	7.0	1.5	2.9
,		•				
once		-				
	1 4.605		4.701	2.356	0.025	0.022
C02, K	1 49.7	8.66	on.	6.7	1.5	6.0
02, %	5.9		4.0	3.B	.5	יוש
HCt ppac	1 9201. 1	12940.	2	37	05	92
HOK pps	14.	17.1	35.	37	8	
Air-fuel ratio	15.73	14.17	14.23	6.	5	9.
Emission rates, q/hr:	_		_	_		
CO	1326.	1067.	1314.	623.	1.1	L.
HC	-	180.1	155.6	3	2.7 1	E)
*OX **	1 0.7 1	0.7	1.6	7.9 1	111.7	170.0
-	1093.	1086.	880.	1 .969	698.	7
			+	+ * * * * * * * * * * * * * * * * * * *		
-	rk ignition e	engine ratin	od code			
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Mag in the second secon	FORE 300 CID	9.1				
	6/20/77	6/20/77	6/21/77	1	7/19/77	63 177 17
	i • c		v	j . v	164.0	759.5
Hummaty, grains/Abssesses	78.	80.	78.	78.		78.
Engine speed, thm.	00	00	0	00	0	0
Torque, 1b-ft.		17.		0:	1.00	20.4
Power, bap	စ္ လာ	11.1	14.1	19-6	0 3	50 KU
deg ET	7.	6		-		0.04
i n		6		ë,	ë.	-
eg	0 0	. ° °	17.5	6.		w) =
	204	206	210	12	196	158.
1	51	50	-	S		-20
Coolant temperatue, F	1 205.	8	209.	206. 1	214.	202.
	Œ	-		-		_
pressure, in 820.	3	. 8	10-4	15.4	6.0	1.0
After catalyst Concentrations dry basis:	60 -					
	0	02	9	88	33	67
	0.8	11.68 1	11.17	9.28	10.97	13.62
024 X	• 6	₹.	. 8	.7	4.0	0.2
HCF ppmC	8	95	317	74	00	73
NOW ppersons	1783.	S.	1548	90	ທຸ	9
•		8 •	9 • 9	8		W)
Baission rates, q/hr:		•		Č		9
	7		2	200	1055.	7
HC	3		72.6	118.0	3	64.8
NOX	1 205.4	e m	247.0 4	00.		
re, P.		m	9	2	813.	1 .099
orrected - SAB J245 Spar	k ignition	engine Eating	g code	+ 1999 179 1879 1879 1879 1879 1879 1879	* * * * * * * * * * * * * * * * * * *	
** Corrected for humidity						

Mest Ausber						
	1 1/1/	7/18/77	1/1/1/1	1/18/17	1 1/1 /	69
	759.5 1	764.3	759.5	764.3 1	759.2	759.2
ھ	71		75	9	79	1.4
Ambient temperature, P	78.	17. [9	81.	80.	82.
	1000	C	_	000	9	00
TOTARS TARGET TOTAL	3	63		116.7	151.2	183.1
Ower brown and a second of the	9.	2		2	8	35
	6.3	7.	6	-	9	9
g P.T	ö		8	9	8.0	
lanifold vacuus, in Hq	8	9		8	5	5
hrottle angle, deg i	7.0 1		12.	5	20.	31.
_	75	9	54	7	99	56
Oil temperature, P	200.	201. 1	198.	6	203.	
Oil pressure, psi	55.		. 55.	55.	24.	54.
Coolant temperatue, P	206. 1		213. 1	212. 1	213.	206.
Before Catalyst			•	(-
e, 7.	707	790.	N		59	8
Takaust pressure, in 820	2.0 1	3.3 1	2,5	8.5	12.0	15.5
•	- 1	-	-		•	
concentrations, dry basis:	•	•			0	•
CO, X	5	F) (20	e e	79.	3
C02, X	3	ë.	12.91	(L)	12.53	11.54
02, %		₹.	5	5		٠.
HC, ppac.	52		63.	#	~	1466.
NOK. DEB.	49	80E	9	94	959.	955
Air-fuel ratio	9		9	5.6	-	0
hr	_	_				
CO	~	S	8	9	-	47
HC	3.5		2.2	2.3 (61,3 1	
**************************************	2.		8	8	9	9
e, r.	~	29	792.	9	8	1015.

Bngine	PORE 300 CID	0				
Test Mumber	1 11/1 /1	127	6/21/77	12 1	13 1	6/21/77
***************************************				9 4	*********	
			15/6/	1.101	10/01	
Humidity, grains/lb			96.	57.	57. 1	26.
Ambient temperature, F	81. 1	83.	78.	78.	78. (76.
	_		_			
Engine speed, rpm	10001	0	1200.	0	0	00
Torque, 1b-ft*	8.	•	0.2	20.9	0	۳,
Power, bhp*	9.	-	0.1		9.3	
Fuel rate, lb/hr	+		5.3		7.1	
Iquition timing, deg PIC	0.9	_	26.0	2	34.0	
=	0	0	-24.4		-20.1	
•	80.08		3,	5	~	0
CCD	54	4	94.280	24	0.759 (S
Oil temperature, F	207.	207.	199.	200.	202.	204.
Oil pressure, psi	53	80	56.	56.	56.	9
(Ba)	212.		199.	θ	195.	S
Before Catalyst			_		•	
	20	1132.		729. 1	799.	846.
Exhaust pressure, in 820.	18.0		1.0	1.1	2.1 1	3.7
	_	-	•	-	<u>-</u>	
Concentrations, dry Masis:	_		_			
CO, M	31	4.258	3.768	5	0.031	0.028
C02, K	6°	1.6	.7	1.8	1.2	1.0
024 X	0.14		3.87	3.80	4 88 4	e,
HC, ppuC	8 17 17	3	8038	2	78. 1	6 5
NOX DEB.	17	71	47.	54		7
Air-fuel ratio	3	2.	14.77		18.92	19.64
hr		•		_	-	
CO	92	5051.	1217.	17	17.	20.
HC	8	9	147.1	9	2.4 1	
MON		247.7	2.5	34.4	141.1	201.3
Exhaust temperature, F	70	5	856.	3	760.	817.
***********************	+=========		******	+	***********	+ 8 4 1 3 4 9 7 7 3

Corrected - SAR J245 Spark ignition engine rating code
 Corrected for humidity

	PORD 300 CID	0		1		
Heat Water	6/21/77	6,21,77	17 6/21/77	16/12/2	19 6/21/77	7, 6,77
	157.9		757.9	757.	757.9	763.0
Humidity, grains/1b	54.	55.			26.	34.
Ambient temperature, F	80.		81.	83.	83.	72.
	00	00	00	00	200	1200.
Torque, 1b-ft*	85.4	116.8	149.2	182.0	213.1	0
Power, bhp*	9.	. 9	4	-	48.	0.2
Puel rate, lt/hr	0	9	9	3,	\$	5.2
Ignition tising, deg PIC	9	0	5	+	3.	23.5
_	3.		8	3.	0	4
6	3.	• 9	20.5	9.	0	3.5
Brake specific fuel conse.	0.524	Ş	17	9	51	W1
Oil temperature, P	1 205. 1	-	214.	_	18	200.
•	1 56.		. *55	54.	54.	56.
	1 204.	0	204.	6	203.	207.
Before Catalist	_					
G)	1 917. 1	5	0		1212.	584.
Exhaust pressure, in 820.	6.2 1		13.4		26.7	
	_	-	_	-		
Concentrations, dry basis:						
CO, X	1 0.029 1		0.754	4.553	3.754	4.145
C02, X	1.0	1.6	1.5	07.5	0.1	11.82
02, %	٦.	₹.	6.	3.77	3.7	₹.
RC, ppac.	1 75. 1	43	5	1419.	302	9
ROK, pps	20	30	96	679.	1013. [67.
Air-fuel ratio	19.26	8.4	€.	15.00	5.3	12.69
Emission tates, q/ht:				_		
CO	1 23.	9	879.	6607.	• n009	25
#C	3.4	3.0	-	116.8	118.7	122.7
**************************************	9	16	324.7	161.9	99	
	1 879.		1065.	1099.	7	0
****		1		+ 1 1 1 1 1 1 1 1 1 1 1	+	
3245	ignition	engine rating	g code			
** Corrected for bumidity						

MING TO THE PROPERTY OF THE PR	PORE 300 CID	0.	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		. 4	
Test Bumber	73	74	75	16	11	18
Heat Date.	17 6/7	1 6/71	17 6/7	1, 6/7, 1	1/ 6/7	1/6/1
Barometer, as Bq	~		2	762.8	762.8	
Humidity, grains/lb	1 35. 1	35.	36.	36. 1	39. 1	39. (
Ambient temperature, P	2				7	
Knaine speed, tos.	00	00	0	00	00	200
Torque, 1b-ft*	20.			3.	13.	9
	3	9.5	14.2	19.1	25.9	33.5
Fuel rate, 1b/br	9	7.		0	3,	• 9
Ignition timing, deg PIC	3.			θ.	0	S
Hanifold vacuum, in Hg		0.		7	9.	8.
Throttle angle, deg			10.	13.	18,	21.
Brake specific fuel cons*.	31	16	-	3	0.517	48
Oil temperature, F	~		m)	0	90	0
Oil pressure, psi	2		26.	26. 1	26.	5
Coolant temperatue, F	_		204	206. 1	188.	205.
Before Catalyst						
	1 712. 1		8	928.	1058.	
Exhaust pressure, in H20		2-0 1	3.5	5.7 1	•	
•	_			-		***************************************
Concentrations, dry basis:		•	-	•	-	- (
CO, X	0.934			0.030 (0.030	
C02, X	3.7	3.6	3.2	٦, د	3.6	-
02, X	0.3	•	4.	7	7	• 2
HC, ppsc	2 2	Θ	m		3	16
NOR DEB.	9	9	9	•	7	36
Air-fuel ratio	7		5	9	.7	
hr	_		_	-	_	
CO	33	4.3	9	-	SO.	20
HC	1 E*nn	2.4 1	2.5	2.4	2.2	12.1
MON WAY	9.		0			
	29	3	797.	9	*966	1073. 1
			1	+ = = = = = = = = = = = = = = = = = = =	+ = = = = = = = = = = = = = = = = = = =	+ + + + + + + + + + + + + + + + + + + +
Jamas Spa humidity	rk agnition e	ngine tatin	g code			

79 79 77 67.3 77 80.7 77 80.7 6724/78 76524/77 6724/72 6724/77	79 79 77 70 77 6724 77 6724 76.23 76.24	79 79 79 70 71 71 71 171 6,24,77 6,24,				ı			
Problem Problem <t< th=""><th>Problem Problem <t< th=""><th>Feb. 1 762.3 762.3 764.3 765.6 1 765.8 75. 41.</th><th>ĺ</th><th>1 16/1</th><th>80 (6/7</th><th>718/7</th><th>724/7</th><th>23</th><th>24/7</th></t<></th></t<>	Problem Problem <t< th=""><th>Feb. 1 762.3 762.3 764.3 765.6 1 765.8 75. 41.</th><th>ĺ</th><th>1 16/1</th><th>80 (6/7</th><th>718/7</th><th>724/7</th><th>23</th><th>24/7</th></t<>	Feb. 1 762.3 762.3 764.3 765.6 1 765.8 75. 41.	ĺ	1 16/1	80 (6/7	718/7	724/7	23	24/7
b 41. 44. 96. 52. 55. 5 e. F 77. 77. 77. 77. 77. 77. 77. 77. 78. 78. 79. 6 e. F 1200. 1200. 1600.	bears. 177. 77. 82. 55. 55. 65. 65. 65. 65. 65. 65. 65. 65	be.e. 41. 44. 96. 52. 75. 66. 1200. 1200. 1600. 1600. 1600. 1600. 123.4 25.7 6.2 7.8 13.2 66. 123.4 25.7 6.2 7.8 13.2 66. 123.4 25.7 6.2 7.8 13.2 66. 123.4 25.7 6.2 7.8 13.2 66. 123.4 25.7 6.2 7.8 13.2 66. 123.4 25.7 6.2 7.8 13.2 66. 123.4 25.7 6.2 7.8 13.2 66. 123.5 25.8 20.8 13.8 10.8 10.7 123.6 14.2 10.8 10.8 10.7 133.5 13.2 13.1 14.2 10.8 10.8 10.7 14.2 13.2 13.1 13.0 13.1 15.0 13.2 13.1 13.4 15.0 10.8 10.5 15.0 10.5 10.7 13.1 15.0 10.6 11.6 11.6 11.6 15.0 10.5 10.7 11.8 15.0 10.5 10.7 10.8 15.0 10.5 10.7 10.8 15.0 11.6 11.6 11.6 15.0 11.6 11.6 15.0 11.6 11.6 15.0 10.5 10.6 15.0 10.6 11.6 15.0 10.6 11.6 15.0 11.6 11.6 15.0 11.6 11.6 15.0 11.6 11.6 15.0 10.5 15.0 10.5 15.0 10.5 15.0 10.5 15.0 10.5 15.0 10.5 15.0 11.6 15.0 11.		1 ~	62.	3	8	65.	65
E, F 77. 77. 77. 79. 82. 78. 79. 80. 78. 79. 80. 1600.	e, F 77. 77. 79. 8 e, F 1200. 1200. 1600. <td>F. F</td> <td>b</td> <td>1 41. 1</td> <td>44.</td> <td>9</td> <td>R</td> <td>2</td> <td>~</td>	F. F	b	1 41. 1	44.	9	R	2	~
1200. 1200. 1600. 1600. 1600. 1600. 1600. 1600. 1600. 1700.	1200. 1200. 1600. 1600. 1600. 1600. 1600. 1600. 1600. 179.5 215.9 0.8 22.3 43.2 66.8 13.1 20.8 143.2 23.4 123.4 25.7 6.2 7.8 19.9 17.9 120.0 23.0 10.0 2 23.4 25.7 6.2 7.8 19.9 17.9 120.0 29.0 10.0 2 29.0 10.0 2 29.0 10.0 2 29.0 10.0 2 20.0 20.0 20.0 20.0 20.0 20.0	1200. 1200. 1600. 1600. 1600. 1600. 1600. 1600. 1600. 179.5 1215.9 0.8 122.3 43.2 6.8 13.1 22 23.4 49.1 6.2 7.8 19.9 122 23.4 25.7 6.2 7.8 19.9 122 23.4 25.7 6.2 7.8 19.9 122 23.4 25.7 6.2 7.8 19.9 122 20.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	9	-	-	N	8	6	0
179.5 215.9 0.8 22.3 43.2 6.8 40.8 49.1 0.2 6.8 13.1 23.4 25.7 6.2 7.8 9.9 23.4 25.7 6.2 7.8 9.9 12.5 40.0 39.0 40.0 20.6 -24.8 -21.9 40.0 20.6 20.6 -24.8 -21.9 20.6 20.6 20.6 6.5 20.7 20.8 213. 20.8 213. 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8 20.8	179.5 179.5 215.9 0.8 22.3 43.2 66.8 13.1 20 140.8 143.2 66.8 143.2 20 140.8 140.0 39.9 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 140.0 31.2 3	T79.5 179.5 1215.9 1 0.8 1 22.3 1 43.2 1 66 140.8 1 25.7 1 6.2 1 6.8 1 9.9 1 12.0 1 13.1 20 180.0 1		6	200	00	600	. C	C
# # # # # # # # # # # # # # # # # # #	9 ETC. 40.8 49.1 0.2 6.8 13.1 20 1	## 190.8 49.1 0.2 6.8 13.1 20 ## 25.7 6.2 7.8 9.9 12 ## 25.7 6.2 7.8 9.9 ## 25.7 6.2 7.8 9.9 ## 25.7 6.2 7.8 9.9 ## 25.7 6.2 7.8 9.9 ## 20.0 11.0 ## 20.0 20.0 1.146 0.753 0.6 ## 20.0 20.1 20.2 20.5 20.5 ## 20.0 20.1 20.2 20.8 ## 20.0 20.1 20.2 20.8 ## 20.0 20.1 20.2 20.8 ## 20.0 20.1 20.2 20.8 ## 20.0 20.0 ## 20.0 20.0 0.00 ## 20.0 20.0 ## 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 20.0 ## 20.0 ## 20.0 20.0		6	15.	6	22-	m	9
eq ETC. 23.4 25.7 6.2 7.8 9.9 12 eq ETC. 8.0 8.0 40.0 39.0 40.0 36 n Hq -4.2 -0.6 -24.8 -21.9 -17.9 -14 g 20.5 60.0 28.2 1.146 0.753 0.6 I const. 20.5 21.1 20.5 210. 20.5 F 1163. 1234. 800. 806. 867. 92 e. F 1163. 1234. 800. 806. 867. 92 f. HzO. 20.1 26.2 2.1 3.5 5.5 f. HzO. 20.1 26.2 2.1 3.5 5.7 f. HzO. 11.25 12.13 14.29 10.83 10.78 11. f. HzO. 13.2 13.13 15.02 19.80 19.89 19.89 hr: 4293. 5872. 23. 17.6 106.5 165. e. F 107.5 107.1 13.4 11.6 e. F 1085. 1146. 864. 763. 837. 89	eq PIC. 23.4 25.7 6.2 7.8 9.9 12 eq PIC. 8.0 8.0 8.0 40.0 39.0 40.0 n Rq -4.2 -0.6 -24.8 -21.9 -17.9 -14 g0.572 0.524 28.240 1.146 0.753 0.6 I const. 0.572 0.524 28.240 1.146 0.753 0.6 f0.572 0.524 28.240 1.146 0.753 0.6 e, F 1163 1234 201. 208. 209. 210. 21 y basis: 3.360 4.252 0.060 0.030 0.029 0.0 y basis: 11.25 12.13 14.29 10.83 10.78 11 y basis: 13.22 13.13 14.29 10.83 10.78 11 hr: 4293 5872 23. 24. 65. hr: 107.5 1146 13.4 15.02 19.80 19.89 19.8 e, F 1085 1146 864 763 837 69	eq PIC. 6.0 7.8 9.9 12 12 12 12 12 12 12 1		0	49.			സ	0
eq PTC 8.0 8.0 40.0 39.0 40.0 39.0 40.0 39.0 40.0 39.0 40.0 39.0 40.0 39.0 40.0	eq PTC 8.0 8.0 40.0 39.0 40.0 36.0 n Rg -4.2 -0.6 -24.8 -21.9 -17.9 -17.9 g 29.0 60.0 2.0 1.146 0.753 0.6 1 Const. 0.572 0.524 28.240 1.146 0.753 0.6 1 Const. 208. 213. 205. 205. 210. 210. e, F 1163. 1234. 800. 806. 867. 92 in R20. 20.1 26.2 2.1 3.5 5.5 f. Rasis: 3.360 4.252 0.060 0.030 0.029 0.0 f. F 14.29 14.29 10.83 10.78 11. f. Rasis: 13.22 13.13 14.6 19.80 19.89 19.89 hr: 4293. 5872. 23. 17.6 106.5 165. e, F 1085. 1146. 864. 763. 106.5 165. e, F 1085. 1146. 864. 763. 1085. hr: 1085. 1146. 864. 763. 1087. hr: 1085. 1146. 864. 763. hr: 1085. 1085. 1085. hr: 1085. 1085. 1085. hr: 1085. 1085. 1085. hr: 1085. 1085. 1085. hr: 1085.	eq PIC 9.0 9.0 -24.8 -21.9 -17.9 -14.0 By const. -4.2 -0.6 -24.8 -21.9 -17.9 -14.0 Gonst. 0.572 0.524 28.240 1.146 0.753 0.5 Loonst. 208. 213. 205. 205. 205. Fraction angine rating code -24.8 -24.8 -21.9 By const. 163. 1234 28.240 10.83 10.78 By const. 163. 1234. 206. 206. 206. By const. 203. 201. 208. 209. 210. By const. 203. 201. 208. 209. 210. By const. 203. 220. 200. By const. 203. 220. 200. By const. 203. 203. 203. By const. 203. 203. 203. By const. 203. 203. 203. By const.	•	3	5			6.6	~~
Here -4.2 -0.6 -24.8 -21.9 -17.9 -14.0 1 const. 29.0 80.0 55.0 8.5 11.0 15.0 1 const. 0.572 0.524 28.240 1.146 0.753 0.65 1 const. 208. 213. 205. 205. 211. 211. 2	n Hg -24.2 -0.6 -24.8 -21.9 -17.9 -14.6 g 29.0 80.0 5.0 8.5 11.0 15.0 g 29.0 80.0 20.5 1.05.1 20.5 10.75.3 0.0 g 208. 205. 205. 205. 205. 210. 20 e F 203. 1234. 800. 806. 867. 20 e F 203. 1234. 800. 806. 867. 92 in H20 20.0 0.030. 0.029. 0.0 0.0 f H20 12.13 14.29 10.0 0.029 0.0 0.0 f 1467. 13.5 21. 15.0 19.89 19.89 19.89 f 107.5 13.0 13.4 15.0 19.89 19.89 19.89 f 107.5 1146. 864 763 106.7 106.7	By an array of the color of the	eq PI	8		0		0	9
g 29.0 80.0 5.0 8.5 11.0 15 15 15 15 15 15 15 1	g 29.0 80.0 5.0 8.5 11.0 15 15 15 15 16 15 16 15 16 15 16 15 16 15 16 15 16 15 16 15 16 16	g 29.0 80.0 5.0 8.5 11.0 15 15 15 16 15 16 15 16 15 16 15 16 15 16 15 16 15 15	n Hq.		0	4.	21.	17	ਤ
I cons** 1 0.572 0.524 28.240 1.146 0.753 0.65 208* 213* 1 205* 205* 205* 211* 208* 208* 205* 205* 205* 211* 211* **** 203* 201* 208* 209* 210* 210* **** 1163* 1234* 1000* 1006* 1060* 1067* 102 **** 1163* 1234* 1000* 1000* 1000* 1000* 1000* 1000* 1000* **** 1163* 1234* 1000*	CONS*. 0.572 0.524 28.240 1.146 0.753 0.6 208. 205. 205. 211. 21 208. 213. 205. 205. 211. 21 203. 201. 208. 209. 210. 20 1163. 1234. 800. 806. 867. 92 In R20. 20.1 26.2 2.1 3.5 5.5 80 In R20. 20.1 26.2 2.1 3.5 5.5 80 In R20. 20.1 26.2 2.1 3.5 6.0 6.0 In R20. 11.25 12.13 14.29 10.83 10.78 11 In R20. 13.22 13.13 14.29 10.83 10.75 10 In R20. 13.22 13.13 14.6 10.80 10.6.5 10 In R20. 107.5 1146. 864. 763. 837. 89	i cons*. 0.572 0.524 28.240 1.146 0.753 0.6 208. 213. 205. 205. 211. 211. 55. 56. 201. 208. 209. 210. 7 F 1163. 1234. 800. 806. 867. 92 in R20. 20.1 26.2 2.1 3.5 5.5 8 7 Fasis: 3.360 4.252 0.060 0.030 0.029 0.0 11.25 12.13 14.29 10.83 10.72 11. 11.25 12.13 14.29 10.83 10.72 10.3 11.25 13.5 211. 60. 62. 62. 62. 11.25 13.5 13.5 15.02 19.80 19.89 19. hr: 4293. 5872. 23. 177.6 105.5 165.5 107.5 1146. 864. 763. 837. 8937. 3245 Spark ignition engine rating code	9	6	0			•	S
Fr 208. 213. 205. 205. 211. 21 55. 55. 56. 49. 48.	Fr 208. 213. 205. 205. 211. 21 55. 55. 58. 49. 48. 4	Fr. 208. 213. 205. 205. 211. 211. 55. 55. 55. 58. 49. 48. 48. 6. F. 1163. 1234. 800. 806. 867. 92 In R20. 20.1 26.2 2.1 3.5 5.5 82 In R20. 20.1 26.2 2.1 3.5 5.5 82 In R20. 11.25 12.13 14.29 10.83 10.78 11. In R20. 13.22 13.13 15.02 19.80 19.89 19.80 In R20. 13.22 13.13 14.6 106.5 165.8 In R20. 107.5 1146. 864. 763. 837. 89 July Spark ignition engine rating code	I con	57	.52	8.24	3		• 6
Fr 55. 55. 56. 49. 48. 48. 48. 48. 48. 203. 201. 208. 209. 210. 200. 203. 203. 1234. 800. 806. 867. 92 48.	F 55. 55. 56. 49. 48. 48. 48. 48. 48. 48. 203. 201. 208. 209. 210. 200. 203. 220.	F 255. 555. 568. 49. 48. 48. 48. 48. 48. 203. 201. 208. 208. 209. 210. 203. 1234. 800. 806. 867. 92 20.1 26.2 2.1 3.5 5.5 802. 805. 10.0 806. 867. 92 805.	•	08	7	9	50	~	_
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Fr 1163. 1234. 800. 806. 867. 926 In R20. 26.2 2.1 3.5 5.5 6.0 Y basis: 3.360 4.252 0.060 0.030 0.029 0.03 11.25 12.13 14.29 10.83 10.78 11.1 O.15 0.32 0.43 5.66 5.74 5.2 14.67. 1335. 211. 60. 62. 63 In R20. 13.13 15.02 19.80 19.89 19.3 In R20. 107.5 107.1 4.6 2.1 2.8 In R20. 157.0 310.1 13.4 117.6 106.5 165. E. F 1085. 1146. 864. 763. 837. 894.	Fr 1163. 1234. 800. 806. 867. 926 In R20. 26.2 2.1 3.5 5.5 6. The six: 3.360 4.252 0.060 0.030 0.029 0.03 In R20. 11.25 12.13 14.29 10.83 10.78 11.1 In R20. 13.50 4.252 0.060 0.030 0.029 0.03 In R20. 13.50 13.50 13.50 15.02 19.80 19.89 19.3 In R20. 13.22 13.13 15.02 19.80 19.89 19.3 In R20. 107.5 107.1 4.6 2.1 2.8 3.0 In R20. 1146. 864. 763. 837. 894	Fr. 1163. 1234. 1 800. 1 806. 1 867. 1 926 In H20. 20.1 26.2 2.1 3.5 1 5.5 1 6.0 Fasis: 3.360 4.252 0.060 0.030 1 0.029 1 0.03 11.25 12.13 14.29 1 10.83 1 10.78 1 11.1 11.25 0.15 0.32 0.43 5.6 5.74 5.74 5.74 13.35 1 13.5 1 216. 1125. 19.80 1 19.89 1 19.36 In H20. 1367. 1 13.13 1 15.02 1 19.80 1 19.89 1 19.39 E. F. 107.5 1 146. 1 864. 1 763. 1 837. 1 894.		0	0	08	9	2	207
fin H20 1163. 1234. 600. 606. 667. 926 fin H20 26.2 2.1 3.5 5.5 6. fin H20 26.2 2.1 3.5 5.5 6. fin H20 3.360 4.252 0.060 0.030 0.029 0.03 fin H20 3.360 4.252 0.060 0.030 0.029 0.03 fin H20 3.360 4.252 0.060 0.030 10.78 11.1 fin H20 3.360 4.252 0.060 0.030 10.78 11.1 fin H20 14.29 14.29 14.29 10.83 10.89 19.3 fin H20 13.40 13.40 15.02 19.80 19.89 19.3 fin H20 107.5 107.1 4.6 2.1 2.8 fin H20 157.0 310.1 13.4 177.6 106.5 165 fin H20 1085. 1146. 864. 763. 837. 894.	In H20. 1163. 1234. 600. 606. 667. 926 In H20. 20.1 26.2 2.1 3.5 5.5 6. Y basis: 3.360 4.252 0.060 0.030 0.029 0.03 11.25 12.13 14.29 10.83 10.78 11.1 11.25 12.13 14.29 5.66 5.74 5.2 11.25 13.5 211. 60. 62. 68 11.25 13.5 15.02 19.80 19.89 19.3 11.25 107.5 107.1 4.6 2.1 2.8 11.27.0 310.1 13.4 117.6 106.5 165. 11.16. 1085. 1146. 864. 763. 837. 694	In H20. 1163. 1234. 600. 606. 667. 926 In H20. 20.1 26.2 2.1 3.5 5.5 6. Y basis: 3.360 4.252 0.060 0.030 0.029 0.03 11.25 12.13 14.29 10.83 10.78 11.1 O.15 0.32 0.43 5.66 5.74 5.2 In H20. 1357. 1335. 211. 60. 62. 68 In H20. 13.22 13.13 15.02 19.80 19.89 19.3 In H20. 107.5 107.1 4.6 2.1 2.8 In H20. 1085. 1146. 864. 763. 837. 894. J245 Spark ignition engine rating code	Before Catalyst						
### pressure, in #20 20.1 26.2 2.1 3.5 5.5 6. ### feet Catalist Oncentrations, dry hasis: 3.360 4.252 0.060 0.030 0.029 0.03 CO. M. 11.25 12.13 14.29 10.83 10.78 11.1 CO. M. 11.25 12.13 14.29 10.83 10.78 11.1 CO. M. 14.25 13.25	######################################	### pressure, in #20 20.1 26.2 2.1 3.5 5.5 6. ### feet Catalist oncentrations, dry basis: 3.360 4.252 0.060 0.030 0.029 0.03 CO. M. 11.25 12.13 14.29 10.83 10.78 11.1 CO. M. 14.29 10.83 10.78 11.1 CO. M. 14.29 10.83 10.78 11.1 ### Inches of the content of the co	e, F	63	3.4	8	90	9	26
######################################	######################################	### Color	pressure, in 820.	0	9			5.5	
CO. M	CO. N. CO. S. C.	CO. X. After_catalrat				_			
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hr: 1467. 1335. 211. 60. 62. 68 68 1367. 216. 1125. 797. 1036 19.80 19.89 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.3 19.4 2.4 2.5 107.5 107.5 107.5 107.5 107.5 1146. 864. 763. 837. 894.	hr: 1467 1335 211 60 62 68 748 1367 216 1125 797 1036 13.22 13.13 15.02 19.80 19.89 19.3 hr: 4293 5872 23 19 24 29 107.5 107.1 4.6 2.1 2.8 157.0 310.1 13.4 117.6 106.5 165. e. F 1085 1146 864 763 837 894	hr: 1467. 1335. 211. 60. 62. 68 748. 748. 1367. 216. 1125. 797. 1036 19.30	02, %	٦.	۳,	₹.	• 6		7
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	********	J245 Spark ignition engine rating cod	Exhaust temperature, F	8	14	9	763.	837.	\$

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1 217.1 1 376.	6.6 4 488.	316.7	401.1	9.5
_	82. 121	16	21	852.

Corrected - SAE J245 Spark ignition engine rating code
 Corrected fcr humidity

Test Date.	11.6/77	1/6/11	1/1/1	11/1/1	והר יר	רו/ר /ר
SALLELINE SERVICE CONTRACTOR OF THE TAXABLE SERVICE TO THE TAXABLE S	761.7	761.5 1	763.0	763.0 1	763.0	763.0
10	=	4	52	S	5	S
re, F.	78.	æ	78.	78.	76.	.11.
	6	5	0024	8	5	9
sugine speed, rpm		3 ,	3 :	5 ,	3 .))
Torque, 1b-ft*	21.0		3			53.
Power, bhp* !	6.3	3	6	9	9	÷
Puel rate, lt/br	7.9		- -	*	8	5
Ignition timing, deg BIC]	39.0	0.04	38°2	35.0	22.5	S
	2	9.	9	3.	8	7.
deq	8	- :	3	8	2.	•
fuel cons	25	73	9	S	50	46
204	206.	207.	208.	211.	211.	214.
-	57.	2	56.	55.	. 56.	מא
6	209.	208.	210.	207.	206.	206.
Before Catalyst				-	_	
re, P	877.	937.	1 * 10 6	4	1158.	1224.
	2.4 1	4.7	7.5	11.0 1	17.2	
•	•	-		-		
Concentrations, dry basis:			i		1	,
CO. X	02	0.2	02	03	0	5
C02, K	13.47	7	3	E.	3	3
02, %		E,	0		9	۳.
HC, Ippac.	113.		45.		. 59.	0
MOX DDB	1176.	46	98	558	30	2
Air-fuel ratio	16.01	16.55	16.27	16.04	15.41	
Emission rates, q/ht;	_			-		
00	14.	15.	18.	0	-	5
HC	1.3	1.4	2.0	2.3	3.9	B.0
**************************************		3	S		7.	3
Exhaust temperature, F	803.		934.	987.	7	20

## Hq	### ### ### ### ### ### ### ### ### ##	763.0 7777 7777 6/27/77 7/23.5 7	Magina	PORE 300 CID	Q				
## Hq. 163.0 160.0 1600.0 2000.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 2000.0 1600.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 2000.0 1600.0 1600.0 2000.0 1600.0 1600.0 2000.0 1600.0 2000.0 2000.0 1600.0 2000.0	## Hq. 163.0	## Hq. 163.0		17/1	90	31	32	33	34 71/13/9
### 179. 73. 73. 73. 74. 75. 72. 73. 74. #### 179. 79. 72. 73. 74. #### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. 79. ##### 179. 79. 79. 79. ##### 179. 79. 79. 79. ##### 179. 79. 79. 79. ##### 179. 79. 79. 79. ##### 179. 79. 79. ##### 179. 79. 79. ##### 179. 79. 79. ##### 179. 79. 79. ##### 179. 79. 79. ##### 179. 79. 79. ###### 179. 79. ####################################	Teacher Fig.	### 170 72 73 74 70 72 73 74 75 75 75 75 75 75 75		63.	63.	63.	63.	H H	m
### Properties F 78. 84. 79. 81. 81. 82. 82. 84. 79. 81. 81. 82. 82. 84. 79. 81. 81. 82	## Properture, P. 18 18 18 18 18 18 18 18	### 1600	•	\mathbf{r}	4	0	~	73. 1	3
### 1600. 1600. 1600. 2000. 2000. 2000. 18.0	### 1600. 1600. 1600. 2000. 2000. 2000. 2000. #### 1600. 1600. 1600. 2000. 2000. #### 1600. 2000. 15.0 15.0 15.9 15.9 #### 1600. 15.0 15.0 15.0 15.9 15.9 #### 1600. 15.0 15.0 15.0 15.9 15.9 #### 1600. 15.0 15.0 15.0 15.9 15.9 #### 1600. 15.0 15.0 15.0 15.9 15.9 #### 1600. 15.0 15.0 15.0 15.0 15.9 #### 1600. 15.0 15.0 15.0 15.0 15.0 #### 1600. 15.0 15.0 15.0 15.0 #### 1600. 15.0 15.0 15.0 #### 1600. 15.0 15.0 #### 1600. 15.0 15.0 #### 1600. 15.0 15.0 #### 1600. 15.0 15.0 #### 1600. 15.0 15.0 #### 1600. 15.0 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. 15.0 #### 1600. #### 1600. 15.0 #### 1600. ##### 1600. ##### 1600. ##### 1600. ##### 1600	### 1600. 1600. 20	Ambient temperature, P	8	3	9	-	-	(4
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10	12.6 67.8 0.1 8.0 15.9 24.8 12.6 12.4 15.0 12.4 12.6 12.6 12.0 12.4 12.6 12.6 12.0 12.2 12.6 12.5 12.5 12.5 12.6 12.6 12.5 12.5 12.7 12.5 12.5 12.6 12.6 12.8 12.8 12.8 12.8 13.5 13.5 13.5 13.8 13.5 13.5 13.5 13.8 13.5 13.5 13.8 13.5 13.5 13.8 13.5 13.5 13.8 13.5 13.5 13.8 13.5 13.5 14.5 13.5 13.5 15.6 13.5 13.5 15.7 12.3 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 14.5 15.8 15.8	15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.9 15.0 15.9 15.0		8 8	3	9 4	3	1 1	7 7 9
15/hr	1b/br. 1b/br. 1b/br. 1b/br. 1c. 0	lib/hr. lib		57.	7:		8	2	3
Table deg FTC 12.0 15.0 442.0 43.	Third, deg FTC 12.0 15.0 42.0 43.0 43.0 43.0 18.3 -15.0 18.3 -15.0 18.3 -15.0 18.3 -15.0 18.3 11.5 15.0 18.3 -15.0 18.3 11.5 15.0 18.3 -15.0 18.3 11.5 15.0 18.3 -15.0 18.3 18.	laing, deg PTC 12.0 15.0 42.0 43.0 43.0 43.0 - 4.7 -1.0 -24.9 -21.1 -18.3 -15.0 - 10.5 1.0 0.5 1 0.5 1 0.5 - 10.6 1.1 0.5 1 0.5 - 10.6 1.1 0.5 1 0.5 - 10.6 1.2 0.5 1 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 0.5 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2 1.2 - 10.6 1.2		6	3		0	2.	5.
ngle, deg	Action in Hg 1.0 -24.9 -21.1 -18.3 -15.0 18.5 11.5 15.0 18.5 18	## 15.0 14.7 -1.0 -24.9 -21.1 -18.3 -15.0 18.4 ### 16.0 33.5 80.0 6.5 11.5 15.0 18.4 ### 16.0 217. 215. 56.470 1.249 0.782 0.625 ### 16.0 217. 215. 214. 216. 218. 218. ### 17.0 217. 215. 218. 218. 218. 218. ### 17.0 218. 218. 218. 218. 218. 218. ### 17.0 218. 218. 218. 218. 22.4 22.4 ### 17.0 22.7 22.7 22.7 22.7 ### 17.0 22.7 22.7 22.7 22.7 ### 17.0 22.7 22.7 22.7 ### 17.0 22.7 22.7 ### 17.0 22.7 22.7 ### 17.0 22.7 22.7 ### 17.0 22.7 22.7 ### 17.0 22.7 22.7 ### 17.0 22.7 23. ### 17.0 22.7 23. ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 27. 23. ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 22.7 ### 17.0 ### 17.0 22.7 ##	q PIC	2.	5.		3.	3.	8
lfic fuel const. 33.5 80.0 8.5 11.5 15.0 18.0 lfic fuel const. 0.511 0.505 56.470 1.249 0.782 0.62 ature, F.S. 217. 215. 214. 216. 218. 220 berature, F.S. 208. 209. 209. 208. 208 all 13.43 12.89 1309. 836. 924. 958. 1013 berature, f. H.ZO. 35.1 45.1 2.7 5.1 8.2 12.0 all 13.4 12.77 12.36 11.06 11.06 11.00 const. 1045. 1450. 45.4 5.42 5.16 5.16 berature, f. H.ZO. 13.05 19.49 19.55 19.25 19.2 all 13.43 13.05 14.0 59.9 126.7 227. berature, f. H.ZO. 14.50 14.0 59.9 126.7 227. all 14.0 16.77 14.50 14.0 10.10 berature, f. H.ZO. 14.50 14.0 10.2 10.2 all 14.0 15.77 12.36 14.0 10.2 10.2 berature, f. H.ZO. 14.50 14.0 10.2 10.2 all 14.0 15.77 12.30 14.0 10.2 10.2 berature, f. H.ZO. 12.30 14.0 10.2 10.2 all 14.0 11.0 11.0 berature, f. H.ZO. 12.30 12.57 23. all 15.0 15.27 12.35 10.3 berature, f. H.ZO. 12.35 10.2 10.0 constitute, f. H.ZO. 12.35 10.2 constitute, f. H.ZO. 12.35 10.2 constitute, f. H.ZO. 12.30 constitute, f. H.ZO. 12.35 constitute, f. H.ZO. 13.35 constitute, f. H.ZO. 13.35 constitute, f. H.ZO. 13.35 constitute, f. H.ZO. 13.05 constitute, f. H.ZO. 13.05 constitute, f. H.ZO. 13.05	### 15.0 14.5 14.5 15.0 18.5 14.5 15.0 18.5 14.5 15.0 18.5 14.5 15.0 18.5 14.5 15.0 18.5 15.0 18.5 15.0 15.0 18.5 15.0	### 19.5 11.5 15.0 18.0 18.5	n. Hg	3	-		+	18.	15.
Ature, F.	Attree, F. S.	lific fuel cons. 0.511 0.505 56.470 1.249 0.782 0.62 attree, F 217. 215. 214. 216. 218. 220 per rature, F 208. 209. 209. 209. 208. 208 per rature, F 1289. 1309. 836. 924. 958. 1013 mper ature, f 1289. 1309. 836. 924. 958. 1013 mal/Richard dry Easis: 3.118 4.096 0.025 0.033 0.023 10.02 mal/Richard dry Easis: 3.118 4.096 0.025 0.033 0.023 10.02 mal/Richard dry Easis: 3.118 4.096 0.025 0.033 0.023 10.02 mal/Richard dry Easis: 3.118 4.096 0.025 10.96 11.10	• • • •	Э.	0		-	5.	æ
re, Fsi	re, Fsi	The Fairners F	CONS	,51	50	6.47	24	•78	•62
Parature, Fairs	Peratue, F	re, Fsi	•	17	75	#	16	18	20
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### ### ### ### ### ### ### ### ### ##	### ### ### ### ### ### ### ### ### ##	### ### ### ### ### ### ### ### ### ##	-	90	60	0	0	8	0
## Perature, F 1289. 1309. 836. 924. 958. 1013 ## PESSULE, In #20. 35.1 45.1 2.7 5.1 8.2 12. ## PESSULE, In #20. 45.1 2.7 12.3 6.023 0.023 0.023 ## PESSULE, In #20. 10.0 10.0 10.0 10.0 ## PESSULE, In #20. 10.0 10.0 10.0 ## PESSULE, In #20. 10.0 10.0 10.0 ## PESSULE, In #20. ## PESSULE, In #20. 10.0 ## PESSULE, In #20. ## PESSULE, In #20. 10.0 ## PESSULE, In #20.	### ### ### ### ### ### ### ### ### ##	### ### ### ### ### ### ### ### ### ##	Before Catalyst	4		-	- 1	- (
1.0 1.0	1.0 1.0	### ### ### ### ### ### ### ### ### ##	H	80	5	36	2	58	<u>ام</u>
12.77 12.36 0.025 0.033 0.023 0.03 0.033	icns, dry basis: 3.118	icns, dry basis: 3.118	pressure, in B20	ŝ	2	•	•		5
icns, dry basis: 3.118 4.096 0.025 0.033 0.023 0.023 12.77 12.36 11.06 10.96 11.10 11.11 pmc	Actions, dry basis: 3.118	Lons, dry basis: 3.118 4.096 0.025 0.033 0.023 0.02 K	After_catalyst	_	•	-			
K	Atto- Sold (12.77) 12.36 11.06 10.96 11.10	Attonomy 12.77 12.36 11.06 10.95 11.10	oncentrations, dry Easi	,	1	1	-	- (-
PPECOLUTE, 12.77 12.36 11.06 10.96 11.10 11.	PPECONOMICS 12.36 11.06 10.96 11.10	pproperties F. 12.77 12.36 11.06 10.96 11.10	CO. X	-	• 0 9	.02	.03	.02	.02
ppc	ppc. 10.05 0.04 5.42 5.44 5.16 5.1 10.05 10.04 4.1 5.16 5.1 10.05 10.04 4.1 5.1 6.1 10.05 10.04 4.1 7.1 10.05 1	ppc. ppc. 1045. 1091. 4. 5.44 5. 5.16 5.16 ppm. 1149. 1091. 4. 65. 6. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	C02, K	2.7	2.3	1.0	• 9	1.1	1:1
ppr	ppr. 1045 1091 4 5 0 0 0 0 0 0 0 0 0	ppr. 1677. 1450. 431. 451. 781. 1149 ppr. 1677. 1450. 431. 451. 781. 1149 attornorm. 13.43 13.05 19.49 19.55 19.25 19.2 ates, g/hr: 5030. 7483. 14. 27. 23. 34. ppr. ature, F. 1227. 1235. 804. 678. 920. 973. d - SAR J245 Spark ignition engine rating code	• • • • • • • • • • • • • • • • • • • •	0	0.	3.	3.	٠.	-
htto	htto	htto	pmC	045	091	- 7	5		
httes, g/hr: 5030. 7483. 14. 27. 23. 34. 98.0 116.0 0.1 0.2 0.0 98.0 116.0 0.1 0.2 0.0 98.0 1227. 1235. 804. 674. 920. 973	ntes g/hr: 5030.	ates, g/hr: 5030. 7483. 14. 27. 23. 34. 98.0 116.0 0.1 0.2 0.0 98.0 116.0 80.0 1227. 1227. 1227. 1235. 678. J245 Spark ignition engine rating code	ppm	677	450	31	51	81	149
ntes, g/hr: 5030. 7483. 14. 27. 23. 34. 98.0 116.0 0.1 0.2 0.0 0. 98.0 145.2 38.0 59.9 126.7 227. putu.5 435.2 804. 674. 920. 973	ntes, g/br: 5030. 7483. 14. 27. 23. 34. 98.0 116.0 0.1 0.2 0.0 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0	ates, g/hr: 5030, 7483, 14, 27, 23, 34, 98.0 116.0 0.1 0.2 0.0 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0	atio	3.4	3.0	4.6	.5	•2	9.2
5030. 7483. 14. 27. 23. 34. 1. 1. 2. 23. 34. 1. 2. 2. 2. 34. 2. 2. 2. 2. 2. 2. 2.	5030 7483 14 27 23 34 34 34 27 23 34 34 34 36 126 27 22 27 22 36 36 36 36 36 37 22 37 37 37 37 37 37	5030. 7483. 14. 27. 23. 34. 14. 27. 23. 34. 16.0 0.1 0.2 0.0	Baission rates, g/hr:	_		_	4919	-	
98.0 116.0 0.1 0.2 0.0 0. 444.5 435.2 38.0 59.9 126.7 227. 1227. 1235. 804. 674. 920. 973	98.0 116.0 0.1 0.2 0.0 0. 98.0 435.2 38.0 59.9 126.7 227. F 1227. 1235. 804. 674. 920. 973	98.0 116.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2 0.0 0.1 0.2	•	030	483	3	1	23.	₹
444.5 435.2 38.0 59.9 126.7 227.	· F 1227. 1235. 804. 674. 920. 973	***** 444.5 435.2 38.0 59.9 126.7 227. ****** 1227. 1235. 804. 874. 920. 973. 245 Spark ignition engine rating code	BC	8	16.		0	0.0	0
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		245 Spark ignition engine rating code		27	23.5	0	-	920.	-

A-11

Engine	FORD 300 CID	Q	- 1			
Mout Musber	60	36 17777	17 E	39 1	77/61/7	92 77 8/7
			•	m	•	•
Humidity, grains/1b	1 74.	75.	76.	87. 1	82°	62.
Ambient temperature, F			96		-08	
Engine speed, tom.	,2000.	00	00	2000.	000	2000
Torque, 1b-ft*	83.3		148.6	181.3	214.8	0.5
Power, bhps	31.8	3	9	69.2	2	0.2 1
Fuel rate, lb/br	7.	3.	9.	36.0	e.	7.7
Ignition timing, deg BIC	5.	~	5	14.5	Ŧ.	÷
Banifold vacuum, in Hg	1 -12.2	8.	9	1 6*n-	÷	-25.6
9	21.	7.	3	37.0 1	80.	8.5
	1 0.562	53	2	0.520	53	94
Oil temperature, F	1 222.	~	7	226.	229.	209.
Oil pressure, psi	1 57. 1		26	57.	57. 1	56.
Coolant temperatue, P	1 208. 1		210.	210.1	208.	210. (
				-		
ture, F	1075.	1192.	1290.	1370.	، ټ	927.
4 4	16.7	27.6	-	Š	6.69	0.0
Are theate	_					
CHCENTER LEGISS OF DE	6		4.6	0	4 640	5
	3,		<u></u>	3 '	7 1 1 1 1	'' °
CO26 Assesses	76-11	7 (13.10	01.71	֓֞֜֜֜֜֜֜֜֜֜֜֜֜֜֓֓֓֜֜֜֜֜֜֜֜֓֓֓֓֜֜֜֜֜֜֓֓֓֜֜֜֜
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	7 6	1420	ם כ	7 6	9000	ם כ
· · · · · · · · · · · · · · · · · · ·	10.430		7.00	- 000 C F	• 000	- LY 34
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/h *saini	•	111	7	70	- 5	r
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HC	0	0	0	92	S.	~
······································	1 298.3	21.	34.		531.7	43.2
Exhaust temperature, P	E)	1205.	9	-	Gr.	e
	71111111	•		+ 1 5 5 5 5 5 5 5 7 7 7	+ = = = = = = = = = = = = = = = = = = =	+11111111
245 Spa	rk ignition e	engine ratin	a code			
TORMOU						

Engine	PORD 300 CID	9				
	97	1 6/19 /	95 17	1 6 11	98	1 11/11/1
Barcaster, as Hq.	i m				770.9	770.9
Bunidity, grains/lb	1 62. 1	e 4° 1	65.	65.	51.	55.
Ambient temperature, F					79.	61.
Mudine speed, tos.	8	00	2000.	00	000	00
Torque, 1b-ft.	20.7	7 2	63.9	10 8	112.7	143.5
Power, bhp.	7.	7.	24.3	2.	2	4
Puel rate, 1b/br	0	2.	15.5	8	2.	æ
9	Э,	2.	41.0	θ.	9.	0
Hanifold vacuum, in Hg		9.	-17.2	3	0	7
Throttle angle, deg	,	14.	17.0	20.	24.	30
Brake specific fuel cons*.	33	5	0.635	56	52	5
Oil temperature, F	1 209.	4	214.	•	219. 1	(4
Oil pressure, psi	S	S	59.		58.	58.
Coolant temperatue, F	1 210.	209.	209.	209.	209.	209.
Before Catalyst						
F 19	9	1051. 3		21	12	-
Exhaust pressure, in 820.	1 5.1	9.2	12.6	16.9 1	25.0	36.3
	_			_		
Concentrations, dry basis:			-		•	,
CO. X			0.030	0.035	0.033	
C02, X	3.4	3.3	3.5	3.6	4.0	4.1
02, %	۲.	٠.	9 •	۳,	9,	d-
HC, Ippac	9	30. 1	57.	7	78. 1	9
MOX ppm	1 671.		1585.	-	9	90
	£.	.2	5.9	5.7		4
4	_	-	_	_		
C0	0	a	30° 1	0	5	99
HC	D*L .	1.5 1	3.3	3.8	6.2 1	25.5
NOX ***			2.	3		462.3
Exhaust temperature, F	7	976.	1016.	1052.	9	1264.
17 17 17 17 17 17 17 17 17 17 17 17 17 1			1		+ = = = = = = = = = = = = = = = = = = =	+ 1 + 1 + 1 + 1 + 1 + 1
* COLLECTED = SAN J243 Spai	rk ignition e	engine ratin	d code			
TOTES						

Engline	FORD 300 CID	•	1			
Hest Date	100 1	102 1	6/28/77	6/28/77	6/28/77	6/29/77
	10.637	41-066	763.5	764.0	763.3	1 7.756
Bunidity, grains/lbs.	57	-	11	80	85.	63
re, ?	82. 1	17.	85.	86. 1	87.	87. I
•						
Engine speed, rom	1 2000. 1	0	0	2500.	2500.	0
Torque, 1b-ft*	1 179.1	19.		19.3	38.5	
Power, bhp	1 68.1 1	٦,		9.1	18.4	
Puel rate, lt/hr	35.1 1		0	13.0	15.9	
P	3	=	43.5	1 0-14	0.04	
i n	ŝ		4	-22.4	-18.6	
•	37.0	90.0	11.0	15.0	17.0	20.0
tuel co	51	52	117.700	1.420	0.863	4)
•	227.	229. 1	223.	225.	227.	229.
•	57.	-	*6h	1 .64	49.	57.
	209.	S	209.	210- 1	210.	210.
Before Catalyst				_		
	1 1402.	1387. 1	1033.		2	
Exhaust pressure, in 820.	S		5.2	1 0.6	13.3	19.2
After catalyst	_	_		_		
Concentrations, dry basis:		,				
CO. X.	1 2.023 1		0.014	0.027 4	0.028	
CO2, X	3.3	2.5	11.16	-	1.2	3.5
02, %	0.12 1		5.17	5.24 1	9	9.
HC, ppmC	615.	5.2	- -	- 0	0	3
MOK PPB	68	9	353	1 698.		1931.
Air-fuel ratio	3	٦.	19,31		16.061	5
Emission rates, q/br:	_	-		_	-	
CO	1 4030. 1	45	=======================================	1 28. 1	S	9
HC	1 71.1 1	144.4	0.2	0.0	0.0	2.9
WOX **	1 578.6 1	-	46.1	119.1		
re, F.	-3		945.	6	8	160
	+ = = = = = = = = +	+ 1 - 1 - 1 - 1 - 1 - 1		*********	+=========	+==========
Corrected - SAE J2	ignition	engine ratin	g code			
** Corrected for humidity						

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6/29/77 6/29/29 6/29/20 25:00 25	45. 45. 45. 46. 47. 679,77 672,77 672,77 7712,	## 195.77 6/29/77 6/29/77 6/29/77 6/29/77 755.4 755.4 755.7 754.9 755.4 755.1 754.9 755.4 755.1 754.9 755.4 755.1 754.9 755.4 755.1 754.9 755.4 755.1 754.9 755.4 755.1 754.9 755.4 755.1 754.9 755.1 754.9 755.1 754.9 755.1 754.9 755.1 754.9 755.1 754.9 755.1 754.9 755.1 755.1 754.9 755.1 75							
Function 755.7 754.9 755.4 755.1 754.9 775.1 754.9 755.4 755.1 754.9 755.1 754.9 755.1 754.9 755.1 755.9 755.1 755.9 755.1 755.9 755	Fure, P	### 1755.7 755.9 755.4 755.1 754.9 770. ##################################		45/29	129/7	129/7	48	129/7	103
ture, F 90. 94. 101. 94. 101. 94. 101. 94. 101. 92	ture, F 2500. 2500	ture, P 2500. 2500		55	54.	5	j w	75	i 0
ture, F 88. 90. 92. 92. 90. 75. pa 2500. 2500. 2500. 2500. pa 2500. 2500. 2500. 2500. pa 2500. 23.5 442.1 175.3 198.0 pa 22.6 23.5 36.6 47.8 33.3 10.0 pa. Hg 42.0 22.6 22.0 35.0 pa. Hg 23.5 27.0 37.0 47.0 80.0 pa. Hg 23.5 27.0 37.0 47.0 pa. In Hg 207. 235. 235. 241. 243. pa. In Hg 207. 235. 235. 26.0 pa. In Hg 207. 235. 236. 208. 1415. pa. In Hg 1199. 1270. 1388. 1398. 1415. pa. In Hg 14.07 14.29 13.60 14.89 pa. In Hg 15.40 14.66 13.99 12.92 12.84 pa. In Hg 15.40 14.66 13.99 12.92 12.84 pa. In Hg 14.5 14.5 14.5 pa. In Hg 14.5 14.6 13.99 12.92 pa. In Hg 14.5 14.5 pa. In Hg 1	ture, F 100.000000000000000000000000000000	ture, P 88. 90. 90. 92. 92. 90. 78 pp	p	90	5.4	3	0	76	-
2500. 2500	December 2500. 2500. 12500. 12500. 2500. 2500. 2500. 2500 2500. 11.0 11.0 11.0 11.0 11.0 11.0 11.0	2500. 2500. 171.9 112.1 175.3 198.0 2.00 2.00 2.00 2.00 2.00 2.00 2.00 2	0, F	8		C	92.	90.	9
## ## ## ## ## ## ## ## ## ## ## ## ##	## ## ## ## ## ## ## ## ## ## ## ## ##	## ## ## ## ## ## ## ## ## ## ## ## ##		500	500	500	500	500	500
Tue, F	10	10	House the Townson of the control of	01.	11.	42.	75	96	7
deg ETC 22.6 28.5 36.6 47.8 53.3 10 32.0 44.2 23.5 23.5 23.6 24.1 60.5 14.3 24.3 22.0 12.0 22.0 14.2 24.3	deg PTC 42.0 32.0 32.0 32.0 32.0 44.0 32.0 44.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 44.0 40.0	deg FTC 22.6 28.5 36.6 47.8 53.3 10. deg FTC 42.0 32.0 22.0 35.0 32.0 deg FTC 42.0 32.0 22.0 37.0 deg FTC 23.5 27.0 47.0 fuel cons 0.580 0.531 0.536 0.571 0.562 11.29 fuel cons 232. 235. 238. 241. 243. fuel cons 232. 235. 238. 241. 243. fuel F 1199. 1270. 1388. 1398. 1415. 1034 e, in H2O 26.4 39.7 61.7 86.3 102.5 5. dry basis: 0.030 0.558 2.008 4.703 4.895 0.021 dry basis: 0.030 0.58 2.008 4.703 4.895 0.21 dry basis: 0.040 14.66 13.99 12.92 12.84 16.3 g/hr: 43. 945. 4181. 1187. 1352. 495 ture, F 465.4 533.6 590.5 13.91 13.50 13.6 dry basis: 465.4 533.6 590.5 13.61 1357. 1367. dry basis: 465.4 533.6 590.5 13.97 13.57 13.57 dry basis: 465.4 533.6 590.5 13.67 dry basis: 465.4 533.6 590.5 dry basis: 465.4 533.6 590.5 dry basis: 465.4 533.7 1357. dry basis: 465.4 533.7 dry basis: 465.4 533.6 590.5 dry basis: 465.4 533.7 dry basis: 465.4 533.7 dry basis: 465.4 533.7 dry basis: 465.4 533.8 dry basis: 465.4 465.4 dry basis: 465.4 533.8 dry basis: 465.4 dry basis: 465.4 dry basis: 465.4 dry basis: 465.4 dr	Power, bhotesessesses	9	53.	68	83.	94.	
deg erc. 42.0 32.0 22.0 35.0 32.0 44 46 46 46 46 46 46 4	deg FTC 42.0 32.0 22.0 35.0 32.0 44.0 A lange FTC 41.9 -10.8 -6.7 -4.1 -2.2 -24.0 A lange FTC 23.5 27.0 0.536 0.571 0.562 11.29 A lange FTC 232. 235. 236. 241. 241. A lange FTC 232. 235. 236. 241. 241. A lange FTC 25.4 25.1 236. 241. A lange FTC 1199. 1270. 1388. 1398. 1415. A lange FTC 14.07 14.29 13.60 11.89 11.79 13.0 A lange FTC 13.00 0.24 0.21 0.19 A lange FTC 13.00 13.00 13.00 A lange FTC 14.00 A lange FTC	deg FTC 42.0 32.0 22.0 35.0 32.0 44. Jin Hg		2	8	9	7.	3	0
deg	deg	deg	deq BIC	2.	2.	2.	5.	2	=
deg 23.5 27.0 47.0 40.0 11.0	deg 23.5 27.0 37.0 47.0 80.0 11.29 fuel const. 0.580 0.531 0.536 0.571 0.562 11.29 gi. 232 235 238 241 243 218 gi. 257 55 56 56 56 219 tue, P 1199 1270 1388 1398 1415 1034 e, in H20. 26.4 39.7 61.7 86.3 102.5 5. dry basis: 0.030 0.558 2.008 4.703 4.895 0.02 dry basis: 0.94 0.24 0.20 11.89 11.79 13.1 52 270 847 1043 1014 16.3 g/hE: 43 945 4181 11279 13712 16.3 g/hE: 465 13.99 12.92 12.84 16.3 g/hE: 465 1359 1357	deg	in Hq.	3	0	9	4	2.	=
fue, cons., 0.580 0.531 0.536 0.571 0.562 11. 232. 235. 238. 241. 243. 243. 57. 27. 27. 211. 211. 208. 210. tue, F 1199. 1270. 1388. 1398. 1415. 10 e. in H20 26.4 39.7 61.7 86.3 102.5 dry basis: 0.030 0.558 2.008 4.703 4.895 6. dry basis: 0.030 0.558 2.008 4.703 4.895 6. 14.07 14.29 13.60 11.89 11.79 13. 2000. 1919. 1726. 1148. 1362. 4 4.3. 945. 4181. 11879. 13712. 4.5.40 4.59. 13.37 153.1 165.0 52. 53.5 590.5 135.1 1367. 14.50. 135.4 135.4 1357. 14.50. 135.4 135.4 1357. 14.50. 135.4 1357. 1357. 14.50. 135.4 1357. 14.50. 135.4 1357. 14.50. 1357. 1357. 14.50. 1357. 1357. 14.50. 1357. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 14.50. 1357. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.50. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 15.40. 14.60. 16.50. 17.50. 17.50. 18.50.	fue, r	fue, r	deg	3.	7.	7.	7.	0	+
ture, F 232. 235. 236. 241. 6 243. 2 tue, F 207. 211. 211. 208. 208. 210. 2 ture, F 1199. 1270. 1 1388. 1 1398. 1 1415. 1 10 dry basis: 0.030 0.558 2.008 4.703 4.895 6. 11.09 dry basis: 0.030 0.558 2.008 1 4.703 1 4.895 6. 11.09 14.07 14.29 1 13.60 11.89 1 11.79 1 13.60 52. 270. 847. 1043. 1 1014. 1 13.99 1 12.92 1 12.84 1 16. 1 165. 0 1 13.99 1 13.99 1 12.92 1 13.84 1 165. 0 12.92 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.99 1 13.90 1 13.99 1 13.90 1 13.99 1 13.90 1	ture, F 232. 235. 238. 241. 243. 243. ture, F 257. 57. 56. 56. 56. ture, F 1199. 1270. 1388. 1398. 1415. 1034 e. in H20. 26.4 39.7 61.7 86.3 102.5 5. dry basis: 0.030 0.558 2.008 4.703 4.895 0.02 14.07 14.29 13.60 11.89 11.79 13.1 0.94 0.24 0.21 0.19 2.1 200. 1919. 1726. 1148. 1362. 495 4.2 26.5 102.7 153.1 165.0 0.2 ture, F 465.4 533.6 590.5 476.4 626.8 56. ture, F 166. 1259. 1337. 1357. 934	tue, F 232. 235. 236. 241. 243. 241. 243. 243. 245. 255. 255. 255. 255. 255. 255. 255	uel con	.58	.53	53	57	•56	29
ture, P 57. 57. 56. 56. 56. 200. 210. 2 ture, P 1199. 1270. 1388. 1398. 1415. 10 dry basis:	tue, P 27. 57. 56. 56. 56. 56. 59. tue, P 207. 211. 211. 208. 210. 211. ture, P 1199. 1270. 1368. 1398. 1415. 1034 dry basis:	tue, P 57. 57. 56. 56. 56. 56. 59. 1034 ture, P 1199. 1270. 1388. 1398. 1415. 1034 dry hasis:		32	35	38	=	43	16
ture, F 207. 211. 211. 208. 210. 2 ture, F 1199. 1270. 1368. 1398. 1415. 10 dry basis: 0.030 0.558 2.008 4.703 4.895 C. dry basis: 0.030 0.558 2.008 4.703 4.895 C. 10.01 10.07 14.29 13.60 11.89 11.79 13 52. 270. 847. 1043. 1014. 52. 270. 847. 1148. 1362. 4 15.40 14.66 13.99 12.92 12.84 16 9/hr: 4.2 26.5 102.7 153.1 165.0 10.01 12.92 1351. 1351. 1357. 10.01 1351. 1351. 1351. 10.01 1351. 1351. 1357. 10.01 1351. 1351. 10.01 1351. 1351. 10.01 1351. 1351. 10.01 1351. 1351. 10.01 1351. 1351. 10.01 1351. 1351. 10.01 1451. 10.01 1451. 10.	ture, F 199. 1270. 1388. 1398. 1445. 1034 ture, F 1499. 1270. 1388. 1398. 1445. 1034 e. in H20. 26.4 39.7 61.7 86.3 1102.5 15. dry basis: 0.030 0.558 2.008 4.703 4.895 C.02 14.07 14.29 13.60 11.89 11.79 13.1 52. 270. 847. 1043. 1014. 11.79 13.1 2000. 1919. 17.26 1148. 11679. 13.30 4.2 26.5 1102.7 153.1 165.0 0.1 4.5 465.4 533.6 590.5 476.4 656.8 56.8 ture, F 1166. 1259. 1337. 1351. 1357.	ture, F 207. 211. 1 211. 208. 210. 210. 211 ture, F 1199. 1270. 1388. 1398. 1445. 1034 dry basis: 0.030 0.558 2.008 4.703 4.895 6.02 dry basis: 0.030 0.558 2.008 4.703 14.895 6.02 32.00 14.29 13.60 11.89 11.79 13.2 22.00 1915. 1726. 1148. 1362. 199 4.2 26.5 102.7 153.9 12.92 12.84 16.3 4.5 40 15.40 14.66 13.99 12.92 12.84 16.3 4.5 40 15.40 133.6 1590.5 476.4 626.8 56.8 AR J245 Spark ignition engine rating code	•	57.	57	9	56	56	59
dry basis: 0.030 0.030 0.558 13.60 14.70 14.895 0.94 0.24 10.27 10.43 11.89 11.79 11.79 11.79 12.00 12.00 13.99 12.92 12.94 10.27 10.24 10.27 10.29	dry basis: 0.030 0.558 13.60 14.89 17.70 14.29 17.26 17.89 17.89 17.79 17.79 17.79 17.79 17.79 17.79 17.79 17.80 17.80	ture, F 1199. 1270. 1388. 1398. 1415. 1034 dry basis:	e, F	0	4	=	0	2	7
dry basis: 10.030 1270. 1388. 1398. 1445. 10 dry basis: 0.030 0.558 2.008 4.703 4.895 C. 14.07 14.29 13.60 11.89 11.79 13 52. 270. 847. 1043. 1014. 1014. 52. 270. 13.99 12.92 12.84 16 9/hr: 43. 945. 4181. 11879. 13712. 465.4 533.6 590.5 476.4 626.8 5	dry basis: 0.030 0.558 2.008 4.703 4.895 6.02 dry basis: 0.030 0.558 2.008 4.703 4.895 6.02 14.07 14.29 13.60 11.89 11.79 13.1 52. 270 847 1043 1014 16 52. 2000 1915 1726 13.99 12.92 12.84 16.3 9/hr: 43. 945 102.7 153.1 165.0 0.0 4.2 26.5 102.7 153.1 165.0 0.0 126.6 133.6 590.5 1351 1357.	dry hasis: 199. 1270. 1388. 1398. 1415. 1034 dry hasis: 0.030 0.558 2.008 4.703 4.895 0.02 14.07 14.29 13.60 11.89 11.79 13.1 5.00. 14.07 14.6 13.99 12.92 12.84 16.3 4/10. 15.40 14.6 13.99 12.92 12.84 16.3 4/10. 15.40 12.9 102.7 153.1 165.0 0.0 4/10. 12.9 11.859. 1337. 1357. 1367. 1934.	Before Catalyst						
dry basis: 26.4 39.7 61.7 86.3 102.5	dry basis: dry basis: 0.030 0.558 2.008 4.703 4.895 0.02 14.07 14.29 13.60 11.89 11.79 13.1 52 270 847 1043 1014 16.3 9/hr: 43 945 4181 11879 12.84 16.3 9/hr: 465.4 533.6 590.5 476.4 626.8 56.	dry basis: dry basis: 0.030 0.558 2.008 4.703 4.895 0.02 14.07 14.29 13.60 11.89 11.79 13.1 0.94 0.24 0.24 0.19 2.1 52. 270 847 1043 1014 16.3 9/hr: 43. 945 13.99 12.92 12.84 16.3 44.2 26.5 102.7 153.1 165.0 0.4 45.45 Spark ignition engine rating code	ture, P	199	270	88	398	415	3
dry basis: 0.030 0.558 2.008 4.703 4.895 C. 14.07 14.29 13.60 11.89 11.79 13. 13.60 11.89 11.79 13.	dry basis: 0.030 0.558 2.008 4.703 4.895 6.02 11.89 11.79 13.1 52. 270 847 1043 1014 165.3 495 1027 11879 13712 10 10 10 10 10 10 10 10 10	dry basis: 0.030 0.558 2.008 4.703 4.895 6.02 14.07 14.29 13.60 11.89 11.79 13.1 0.94 0.24 0.24 0.21 0.19 2.1 200. 1919. 1726. 1148. 1362. 495 9/hr: 43. 945. 4181. 11879. 13712. 19 4.2 26.5 13.7 153.1 165.0 0. 4.2 26.5 1377. 153.1 165.0 0. AB J245 Spark ignition engine rating code	e, in H20	9		+	•	02.	
dry basis: 0.030 0.558 2.008 4.703 4.895 C. 14.07 14.29 13.60 14.89 11.79 13. 14.89 14.79 13. 14.89 14.79 13. 14.89 14.79 13. 14.89 14.79 14.8	dry basis: 0.030 0.558 2.008 4.703 4.895 13.60 11.89 11.79 13.1 0.94 0.24 0.21 0.19 2.1 2.1 2.1 0.94 0.24 0.27 1043. 1014. 165.3 165.0 0.1 165.0 105.4	dry basis: 0.030 0.558 2.008 4.703 4.895 6.02 14.07 14.29 13.60 11.89 11.79 13.1 0.94 0.24 0.24 0.21 0.19 2.1 52. 270 847 1043 1014 16.3 9/hr: 43. 945 1187 11879 13712 19 4.2 26.5 102.7 153.1 165.0 0. 4.5 12.95 1337 1351 1367 934		_		_	-	-	
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14.07 14.29 13.60 11.89 11.79 13 52. 270. 847. 1043. 1014. 2000. 1919. 1726. 1148. 1362. 4 15.40 14.66 13.99 12.92 12.84 16 hr:	14.07 14.29 13.60 11.89 11.79 13.1 0.94 0.24 0.21 0.21 0.19 2.1 52. 270 847 1043 1014 16.3 15.40 14.66 1 13.99 1 12.92 1 12.84 16.3 hr: 4.2 26.5 1 102.7 153.1 165.0 10.4 4.65.4 533.6 1 590.5 476.4 626.8 1 56.4 1166. 1259.1 1337 1 1367 1 934	14.07 14.29 13.60 11.89 11.79 13.1 0.94 0.24 0.21 0.21 0.19 2.1 52. 270. 847. 1043. 1014. 16.3 15.40 14.66 13.99 12.92 12.84 16.3 hr: 43. 945. 4181. 11879. 13712. 19 4.2 26.5 102.7 153.1 165.0 0. 1465.4 533.6 590.5 476.4 626.8 56. 1245 Spark ignition engine rating code	• • • • • • • •	.03	.55	.00	.70	. 89	.02
52, 270, 847, 1043, 1014, 2000, 1915, 1726, 1726, 1748, 1362, 14, 16, 1726, 1726, 1729, 172, 172, 172, 172, 173, 172, 173, 172, 173, 173, 173, 175, 176, 176, 176, 176, 176, 176, 176, 176	0.94 0.24 0.21 0.21 0.19 2.1 52.	52. 0.94 0.24 0.21 0.21 0.19 2.1 52. 270. 847. 1043. 1014. 16 12000. 1919. 1726. 1148. 1362. 495 hr: 43. 945. 4181. 11879. 13712. 19 4.2 26.5 102.7 153.1 165.0 0. 4.5 1259. 1337. 1351. 1367. 934 245. Spark ignition engine rating code	х	4.0	4.2	3.6	1.8	1.7	3.1
52. 270. 847. 1043. 1014. 2000. 1919. 1726. 1148. 1362. 4 hr: hr: 43. 945. 4181. 11879. 13712. 4.2 26.5 102.7 153.1 165.0 6. F 1466. 1259. 1337. 1351.	hr:	hr: 2000, 1919, 1726, 1148, 1362, 495 15,40 14,66 13,99 12,92 12,84 16,3 43, 945, 4181, 11879, 13712, 19 4,2 26,5 102,7 153,1 165,0 0,4 465,4 533,6 590,5 476,4 626,8 56,34 1166, 1259, 1337, 1351, 1367, 934	×	6.		• 2	• 2	0.1	٠.
hr: 15.40 14.66 13.99 12.92 12.84 16 13.91 12.92 12.84 16 13.92 12.92 12.84 16 13.93 10.27 153.1 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 166.0 1	hr: 15.40 14.66 13.99 12.92 12.84 16.3 15.40 14.66 13.99 12.92 12.84 16.3 4.2 26.5 4181 11879 153.1 165.0 0 4.2 26.5 102.7 153.1 165.0 0 4.5 533.6 590.5 476.4 626.8 56. 6.6 1259 1337 1351 1367 934	hr: 15.40 14.66 13.99 12.92 12.84 16.3 15.40 14.66 13.99 12.92 12.84 16.3 4.2 26.5 102.7 153.1 165.0 0.465.4 155.0 0.465.4 155.0 0.465.4 155.0 0.465.4 155.0 13712.4 155.0 0.465.4 155.0 13712.4 155.0 0.465.4 155.0 13712.4 155.0 0.465.4 155.0 13712.4 155.0 13712.4 136.4 13712.4 136.4	ppaC	~	70	47	043	014	16.
hr:	hr: 15.40 14.66 13.99 12.92 12.84 16.3 43. 945. 4181. 11879. 13712. 19 4.2 26.5 102.7 153.1 165.0 0. 465.4 533.6 590.5 476.4 626.8 56. 1166. 1259. 1337. 1351. 1367. 934	hr: 15.40 14.66 13.99 12.92 12.84 16.3 43. 945. 4181. 11879. 13712. 19 4.2 26.5 102.7 153.1 165.0 0. 465.4 533.6 590.5 476.4 626.8 56. 166. 1259. 1337. 1351. 1367. 934	ppm	000	916	726	148	362	95
hr: 43. 945. 4181. 11879. 13712. 4.2 26.5 102.7 153.1 165.0 465.4 533.6 590.5 476.4 626.8 5 6. F 1466. 1259. 1337. 1351.	hr: 43. 945. 4181. 11879. 13712. 19 4.2 26.5 102.7 153.1 165.0 0. 465.4 533.6 590.5 476.4 626.8 56. 7166. 1259. 1337. 1351. 1367. 934	hr: 43. 945. 4181. 11879. 13712. 19 4.2 26.5 102.7 153.1 165.0 0. 465.4 533.6 590.5 476.4 626.8 56. 1166. 1259. 1337. 1351. 1367. 934	•	5.4	4.6	3.9	2.9	2.8	E,
42 26.5 402.7 153.1 165.0 0 165.0 0 165.0 0 165.0 0 165.0 0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 165.0 1357. 1357. 1357. 1367. 93	4.2 26.5 4181, 153, 165,0 0. 465,4 533,6 590,5 476,4 626,8 56. 6,7 1351, 1367, 934	4.2 26.5 4181, 153, 165,0 0. 153,1 165,0 0. 165,0 0. 165,0 165,0 0. 165,0 1259, 1337, 1351, 1367, 934,0 1245 Spark ignition engine rating code	hr			_	_		
4.2 26.5 102.7 153.1 165.0 0 165.0 0 165.0 165.0 165.0 165.0 133.6 590.5 476.4 626.8 56 1259. 1337. 1351. 1367. 93	e, F 465.4 533.6 590.5 476.4 626.8 56.8	4.2 26.5 102.7 153.1 165.0 0 465.4 533.6 590.5 476.4 626.8 56 1166. 1259. 1337. 1351. 1367. 934. 3245 Spark ignition engine rating code	•	3	45		87	712	9
e. F 1 1166. 1 1259. 1 1337. 1 1351. 1 1367. 1 93	e, F 465.4 533.6 590.5 476.4 626.8 56. e, F 1166. 1259. 1337. 1351. 1367. 934	e, F 465.4 533.6 590.5 476.4 626.8 56. e, F 1166. 1259. 1337. 1351. 1367. 934 J245 Spark ignition engine rating code	•		9		53	65.	
e. F 1 1166. 1 1259. 1 1337. 1 1351. 1 1367. 1 93	e. F 1166. 1259. 1337. 1351. 1367. 93	2245 Spark ignition engine rating code	•	65.	33.		16	26.	ŧ.
		J245 Spark ignition engine Eating code	e, P.	16	25		KO.	36	3

	104 1	105 1	106 1	107	109	110
			+++	41-11-11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	**************************************	
Barometer, mm Hq	770.9	170.9	170.9	770.1 1	765.6	765.8
Humidity, grains/lb	83.	80.	78.	86.	1001	36
	78.	76. 1	78. 1	90.	* 100	92
Rnaine speed, tpm	2500.	2500.	2500.	2500.	2500.	2500
Torque, 1b-ft*	18,3	38.6	57.8	77.6	109.3	139
Power, bhpe	8.7	18.5	27.6	37.0	52.2	9.39
Fuel rate, lt/hr	13.1		19.0	22.0	28.0	36.
Iquition timing, deg BIC	44.5		1 0.44	41.0	35.0	20.
S	-22.8	-20.7 1	-18.3	-15.9 (-11.6	-7-
5	14.0	17.0 1	20.0	22.0 1	26.5	35.
i co	1.498	0.865	0.688	0.595	0.538	0.54
Oil temperature, P	220.	223.	226. 1	228.	231.	234
Oil pressure, psissesses	59.	55.	58.	58.	57.	95
Coolant temperatue, F	209.	208. 1	209.	208.	212.	210,
Before Catalyst	-	-	_			
•	1078.	1107. 1	1137. 4	1181.	1253. 1	1382
in H2	B . tt	12.9	18.2	24.6 1	37.3 1	8.8
After catalyst	_	-	-	-	-	
Concentrations, dry basis:		_		_		
CO, X	0.028	0.030 1	0.033	0.031 1	0.369	20
C02, X	13.14	13.35	13.62	14.03	14.45	13.69
02, X	2.03	1.70	1.35	0.87	0.07	0.
AC. DDBC.	22.	36. 1	26. 1	42. 1	150.	687.
MOX. DOM.	834.	1576.	1872.	2009.	2034.	1867.
Air-fuel ratio	16.27	15.99	15.72	15,36	14.64	14.0
Enission rates, q/hr:	_		_		-	
CO	25.	32. 1	- 07	43.	6.15	3540
HC	1.1	2.1	1.8	3.4	14.5	82.6
MOX **	119.2	270.6	373.8	454.2	556.5	635.7
Webanat tonnormtoro	700		1 0707		4250	4330

A-16

* Corrected - SAE J245 Spark ignition engine rating code ** Corrected for hunddity

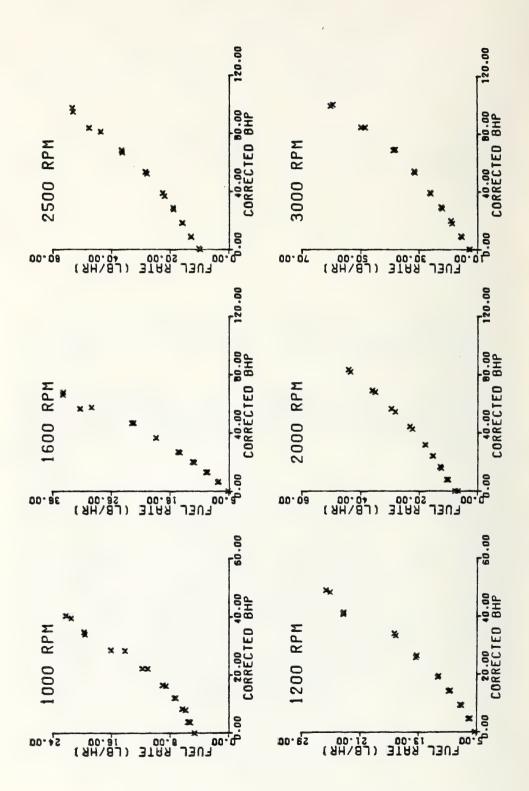
NDG Inc	POBE 300 CID	0				
Tout washer	111 1	125 1719/7	51 6/30/77	52 1 6/30/77 1	53 6/30/77	6/30/77
	5.	(1)	761.	-	61.	•
Humidity, grains/lb	1 .96 1	87. 1	62. 1	. 63.	624 1	62. 1
Ambient temperature, F			****	83° 1	83.	(L)
Engine speed, rpm	500	500	3000	3000.	00	9
Torque, lb-ft*	1 204.8 1	170.0 1	0.5	15.6	35.2 (51.8
Power, bhp	97.	÷		8.9	0	9.
ruel rate, lb/hr	3.	Э.	2.	5.	9°	.4
g BT	• 9	9	• 9	10.94	9	S
		4	4.	-22.7 .1	-20.4	θ.
Throttle angle, deg	0		14.	9	0	22.
CODS	2	5.	-	74	95	96
Oil temperature, P	38		32	33	235.	36
Oil pressure, psi	99	S	S	29. 1	58.	2
Coolant temperatue, F	1 213.		211. 1	210.	211.	211. 1
Before Catalyst		- (. (((
	3			3	62	-
Exhaust pressure, in 820	104.9	79.8 I	9.1		18.2	24.5
		_	-	***************************************	***	-
Concentrations, dry Damis:	1		0	0	•	
CO. X	0	12	60	0.7	0.7	02
C02, X	1.9	3°	m	ъ.	9	=
02° X	1 0.02	0	-	9	1.50	5.
HC, ppmC	915	m	13	20	25	സ
MOX. ppm	S	18	266. 1	1142. (1700.	
Air-fuel ratio	2.8		€,	6.1	.8	5.4
Buission rates, q/hr:	_		_	-		-
CO	222	13	-		£	-
ИС	e 6 n	103.6 1	0	1.2 1		2.9 1
MOX **	672.5	670.0	78.9			
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* Corrected ** SAB J245 Sparies Corrected for humidity	k ignition e	ingine rating	g code			

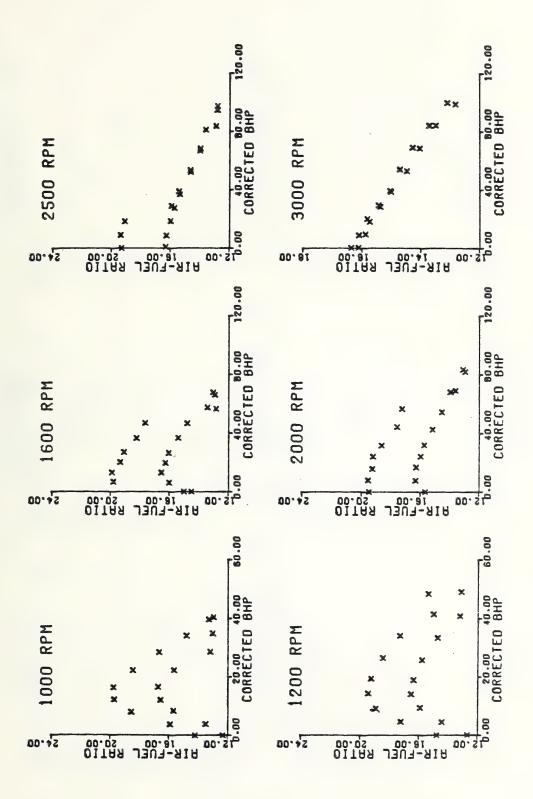
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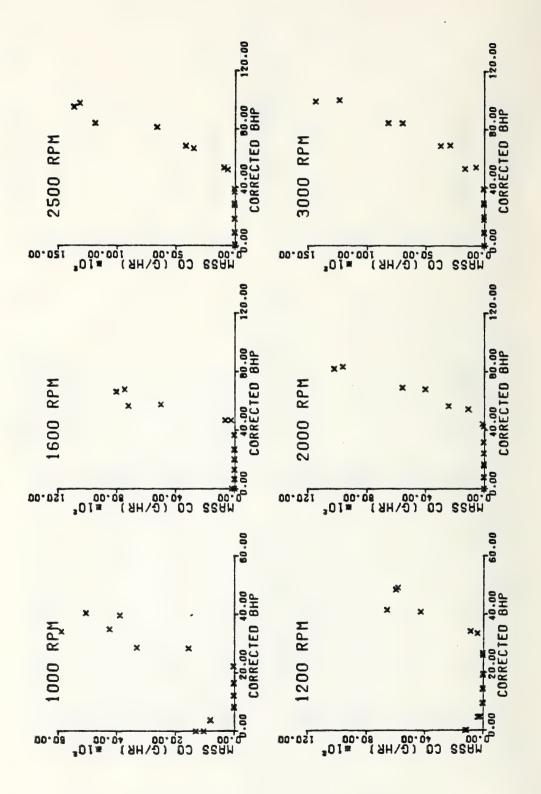
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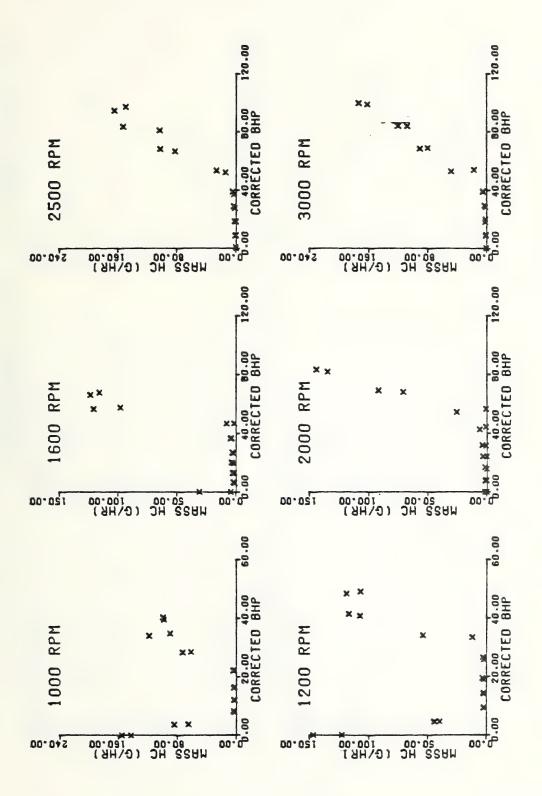
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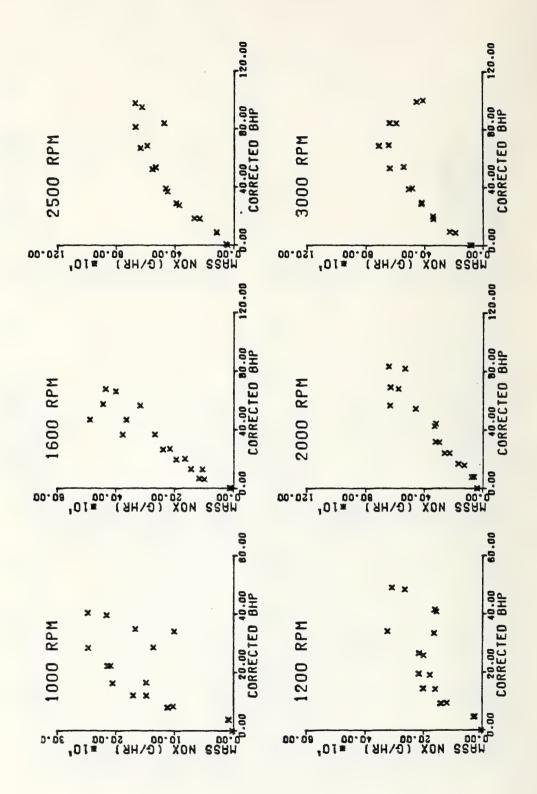
APPENDIX B GRAPHICAL SUMMARY OF ENGINE MAP DATA

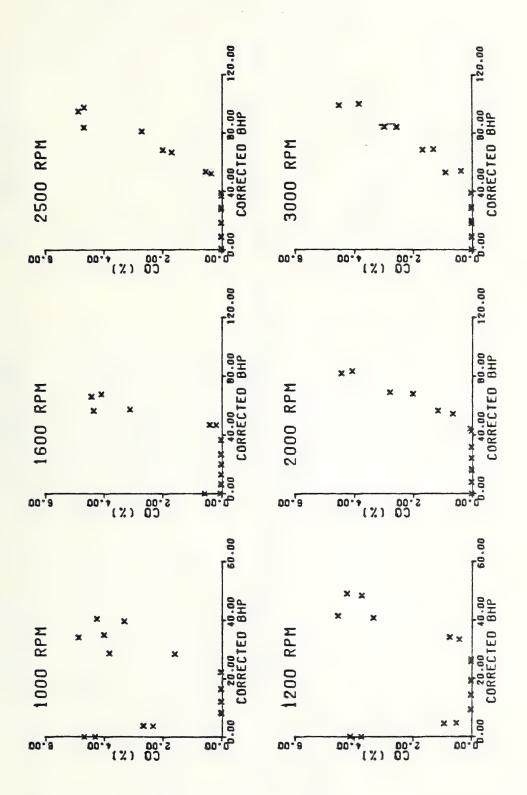


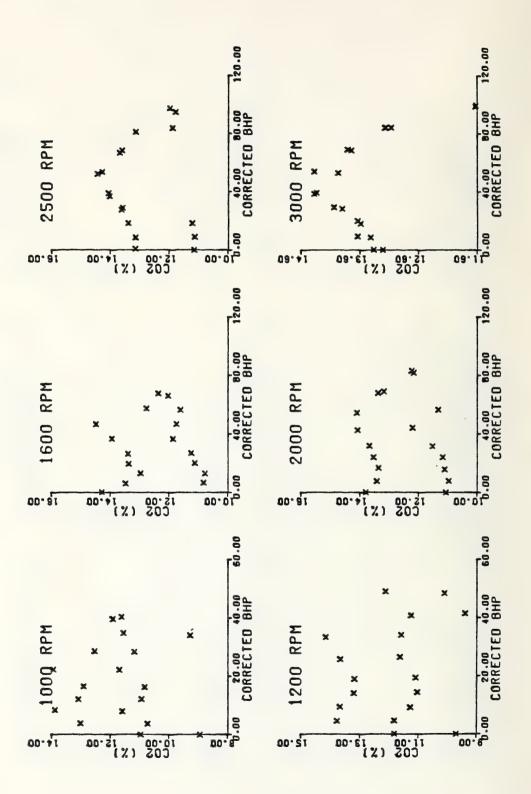


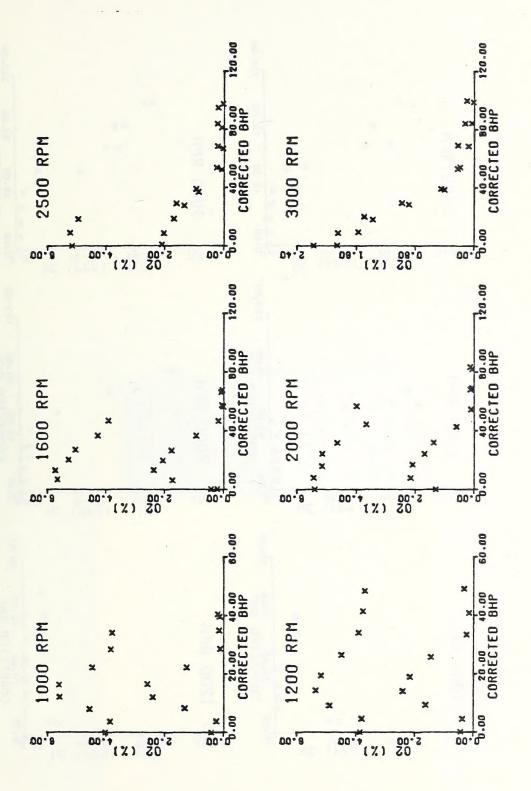


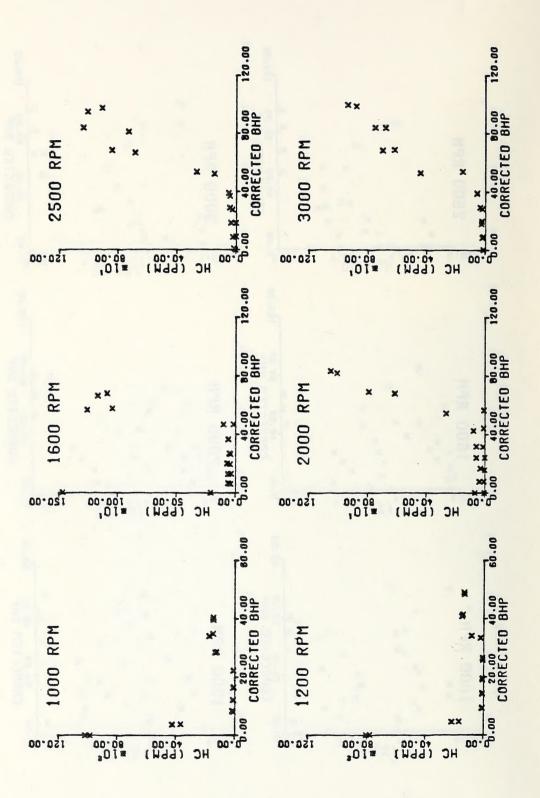












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